

# OIL-COLLECTING BEES OF THE WINTER RAINFALL AREA OF SOUTH AFRICA (MELITTIDAE, REDIVIVA)

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(With 64 figures and 1 table)

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## ABSTRACT

The species of *Rediviva* (Apoidea, Melittidae) occurring in the winter rainfall region of South Africa are reviewed. Fifteen species are recognized, with nine described as new. The new species include *R. bicava*, *R. intermedia*, *R. macgregori*, *R. micheneri*, *R. ruficornis*, *R. aurata*, *R. parva*, *R. alonsoae* and *R. nitida*. The six known species, *R. gigas* Whitehead & Steiner, *R. albifasciata* Whitehead & Steiner, *R. intermixta* (Cockerell), *R. emdeorum* Vogel & Michener, *R. longimanus* Michener and *R. peringueyi* (Fries), are redescribed. Distribution and host plants are given for all species and a key to males and females is presented. Mouth-parts, wings and male terminalia as well as front and hind legs of females are illustrated. Location of types is given and a lectotype for *R. peringueyi*, type species of the genus, is designated.

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## INTRODUCTION

It has long been known that solitary bees visit flowers to collect pollen and nectar to use as a food source for their developing larvae. However, it was only relatively recently discovered that some solitary bees collected non-volatile floral oils as an additional food source for the nest (Vogel 1969, 1971). Although it has been suggested that these oils can serve both a nutritive and non-nutritive function (i.e. nest cell construction) (Cane *et al.* 1983), it seems likely that their role as an energy-rich food supplement is far more important than their role as construction material precursors for the nest cell lining (Simpson & Neff 1989, 1983; Vinson *et al.* 1997).

It was originally thought that oil collection occurred only among New World members of the former Anthophoridae (i.e. eight genera in the tribes Centridini, Exomalopsini and Tertapedini) (Vogel 1974), but subsequent studies have revealed that oil collection occurs in two additional groups of bees, the Ctenoplectrini (formerly Ctenoplectridae) and Melittidae (Vogel 1976, 1981, 1984, 1990; Whitehead *et al.* 1984). *Ctenoplectra*, an Old World genus formerly placed in its own family and considered to be the sister group to all long-tongued bees, is now placed in a tribe nested within the Apinae, is more closely related to the New World oil-collecting bees (Roig-Alsina & Michener 1993). The Melittidae are more distantly related, being basal to all long-tongued bees (Roig-Alsina & Michener 1993). This indicates that oil-collection in the Melittidae must have evolved independently of oil-collection in the Apinae. Oil-collection in the Melittidae is known from two genera, the Holarctic *Macropis* and the southern African *Rediviva*. Relationships within the Melittidae are not well known, but the similarities that suggest a close relationship between *Rediviva* and *Macropis* are probably the result of convergent adaptation to oil-collecting rather than any true phylogenetic affinity (Michener 1981). If this is the case then oil collection has evolved twice within the Melittidae.

The genus *Rediviva* consists of approximately 24 species restricted to South Africa, Lesotho and Swaziland, although, based on the distribution of oil-secreting host plants, it probably extends east to Moçambique and possibly as far north as Tanzania (Steiner & Whitehead, unpubl.). In southern Africa, there are two centres of diversity, a summer rainfall, mostly Drakensberg centre and a winter rainfall western Cape centre. The greatest number of species and morphological diversity occurs in the winter rainfall zone. When we began our studies there were four recognized *Rediviva* species in this area: *R. intermixta* (Cockerell), *R. peringueyi* (Friese), *R. longimanus* Michener and *R. emdeorum* Vogel & Michener. We subsequently described two additional species, *R. albifasciata* and *R. gigas* (Whitehead & Steiner 1993, 1994). The purpose of this paper is to describe the remaining nine new species and to redescribe the remaining six species, four of which were described from one sex only, *R. longimanus* (female only), *R. emdeorum* (female only), *R. peringueyi* (female



only) and *R. intermixta* (male only). We also provide the first comprehensive information on their host plants and geographical distribution.

### *History of Rediviva*

In 1911, Friese described *Andrena (Rediviva) peringueyi* from the Cape Colony, South Africa, but had some doubts about its placement; in a footnote he mentioned that it might fit better in *Melitta* or *Dasypoda*. Cockerell (1931) raised *Rediviva* to generic level and included two species, *R. peringueyi* and *R. neliana*. However, he still considered *Rediviva* to belong in the family Andrenidae. It was 50 years later that Michener (1981) moved *Rediviva* to the family Melittidae, subfamily Melittinae, together with *Macropis*, *Dolichochile*, *Redivivoides* and *Melitta*. *Macropis* is separated by having two submarginal cells in the front wing, males with yellow face-markings, a conspicuous pygideal plate and S8 that is not broadened distally. *Dolichochile* has reduced maxillary palps and flat blade-like mandibles in females. *Melitta* has a well-defined propodeal triangle with a granulate surface, a second submarginal cell that is wider than long and the male with the seventh metasomal sternum as a large plate with reduced lobes. *Rediviva* and *Redivivoides* have a small, less well-defined propodeal triangle with shallow punctures and a shiny surface and a second submarginal cell that is longer than wide. *Rediviva* differs in that the hind legs of females have both tibia and basitarsus broad, with fine scopal hairs on the outer surface and foretarsus with dense short vestiture. The hind tibia and basitarsus of *Redivivoides* are slender and the scopal hairs on the outer surface consist of simple bristles; the anterior tarsus is ordinary.

### *Oil-secreting plants and oil-collecting bees in southern Africa*

Stefan Vogel (1969, 1974) was the first to discover the relationship between oil-secreting flowers and oil-collecting bees. Although most of the information he presented pertained to plants and bees from South America, he realized that at least two South African genera, *Diascia* and *Bowkeria*, also secreted oil. He was unable, however, to verify that these genera were pollinated by oil-collecting bees and was unaware of which bees might be involved in the interaction. Working independently on the taxonomy of melittid bees, Michener (1981) noticed that bees in the genus *Rediviva* had modified hairs on the forelegs similar to those of *Macropis*, a known oil-collector from northern temperate regions of Europe and North America (Vogel 1976; Cane *et al.* 1983; Simpson *et al.* 1983). He suggested that the unusually elongated forelegs of *Rediviva longimanus*, a bee from the Western Cape Province, might represent an adaptation to the collection of oil from some specific flower. He was apparently unaware that *Diascia*, with its long, paired, oil-containing spurs was a likely potential host for this bee. It was left to Whitehead *et al.* (1984) to demonstrate the association between *Rediviva longimanus* and a new long-spurred species of *Diascia* (incorrectly identified as *D. longicornis* (Thunb.) Druce (Steiner, unpubl.)). In the same period, Vogel (1984), Vogel & Michener (1985), described a new long-legged *Rediviva*, *R. emdeorum*, from Namaqualand that was collected on a long-spurred *Diascia tanyceras* E. Mey ex Benth. (incorrectly identified as *D. longicornis* (Steiner, unpubl.)). Also in

1984, Hilliard & Burt reported the association of a *Rediviva* species with *Diascia anastrepta* in the Natal Drakensberg. Manning & Brothers (1986) discovered that *Bowkeria verticillata* was also pollinated by a *Rediviva* species, *R. rufocincta* and discussed the association of *R. politissima* with several *Diascia* species and nectar plants. A more complete analysis of the relationship between *Diascia* species from the Drakensberg mountains was provided by Steiner & Whitehead (1988). They determined that the co-occurring and synchronously flowering *Diascia* species often used the same *Rediviva* without incurring reproductive interference by placing pollen on different parts of the bee's body. Steiner (1990) presented evidence to show that the yellow translucent region at the base of the upper lip of the *Diascia* corolla functioned as an orientation cue for its *Rediviva* pollinators, while the strong correlation between *Rediviva* foreleg length and *Diascia* spur length was detailed for *R. neliana* and *R. pallidula* at about the same time (Steiner & Whitehead 1990, 1991). A major advance in knowledge about oil-secreting plants and their pollinators resulted when it was discovered that several orchid genera in South Africa secrete oil and are pollinated by *Rediviva* bees (Steiner 1987, 1989, 1993). More recently, we have explored the reproductive consequences for plants dependent on oil-collecting bees for pollination (Steiner 1993; Steiner & Whitehead 1996).

## METHODS

### Measurements

Measurements were made with a calibrated eye-piece graticule, using a dissecting microscope. Where more than one specimen was measured, means are given with the range in brackets.

Forelegs were removed from dried specimens and mounted on card. Segments were measured individually except for the tarsus where tarsomeres 2–5 were considered as a single unit separate from the basitarsus. Leg length is expressed as the sum of the individual segments (Steiner & Whitehead 1990). Foreleg length is a good diagnostic character for winter rainfall bees but is difficult to measure on pinned specimens. However the sum of the lengths of foretibia and forebasitarsus of females, strongly correlates with overall leg length and is easier to measure. Both measurements are given in descriptions and in the key to the species.

Body length was considered to be the distance from the anterior ocellus to the tip of the metasoma. This measurement was shown to correlate well with body mass (Steiner & Whitehead 1990). Forewings were measured from the outer edge of the tegula to the wing tip.

### Dissection

Male genitalia and associated sterna are more easily removed from fresh specimens, but when these were not available dried material was relaxed for at least two days before removal. The desired parts were extracted with the bent tip of a fine needle and placed overnight in cold 10 per cent KOH after which they were rinsed in acidified water then pure water and dehydrated in 80 per

cent ethyl alcohol. The dissected parts were viewed and drawn in glycerol and stored in the same material in microvials attached to the relevant pinned specimen.

The shape of the terminal expanded part of S8 of males (apical plate) is diagnostic and may be distorted by KOH treatment and subsequent storage in glycerol. It is best restored by placing in 80 per cent ethyl alcohol for 15 minutes to remove the glycerol and dried under a desk lamp for the same period. In freshly killed or relaxed specimens S7 and S8 can be partially extracted so that the apical plate of S8 remains visible on the pinned specimen.

Terms used for the various structures are those of Michener (1944, 1981), Winston (1979), Michener & Greenberg (1980) and Roberts & Brooks (1987) with the exception that we have numbered the foretarsomeres (basitarsus plus 2, 3, 4, 5) to be able to distinguish those adapted for oil collection. The distal, expanded portion of S8 of males is termed the apical plate. Where both dorsal and ventral aspects are illustrated in the same composite figure, the dorsal view is placed on the left.

### *Type material*

Holotype, allotype and other paratypes of new species are deposited in the Entomology collection of the Life Sciences Division of the South African Museum, Cape Town. Holotype and allotype have specific accession numbers; paratypes have collection batch numbers with an alphabetical suffix to indicate individuals.

The primary types of the previously known species were examined and their place of deposition noted.

### *Abbreviations and descriptive terms used for surface structure*

The letters S or T with a numerical suffix indicate respectively a specific sternum or tergum of the metasoma. L : W is the length to width ratio of the malar space and FL : B is the foreleg to body ratio. The sum of the foretibia and forebasitarsus is abbreviated to Ft+bt. The designation of the various sclerites at the base of the labium are: c for cardo, f for fragmentum of the prementum, l for lorum, m for mentum, p for prementum and s for stipes.

Descriptive terms for surface sculpturing follow those of Harris (1979) and are as follows:

*coriaceous*—leather-like in texture, with minute cracks like the human skin

*costulate*—with fine longitudinal ridges or lines.

*crenulate*—margin finely notched with small rounded teeth.

*strigate*—having narrow transverse lines

### *Geographic locations*

Collection localities have been given using a degree reference system that is a modification of the latitude-longitude system used for many years by zoologists and cartographers in South Africa (Edwards & Leistner 1971). The basic unit is a one-degree square of latitude and longitude which is sub-divided into half-degree squares labelled A, B, C and D from left to right and top to bottom. Each half-degree square is further divided into quarter-degree squares



and again numbered A, B, C and D. The locality is designated by the degree of latitude and longitude in the north-west or top left-hand corner and by a town or other feature of importance in the square and by the appropriate letter in the half- and quarter-degree squares.

### *Names of collectors*

Most of the material examined was collected by the authors and Mrs M. Cochrane (née MacPherson), collections manager of the insect collection at the South African Museum. The collectors name has been given in full for holotypes and allotypes but for other material has been abbreviated: VBW for V. B. Whitehead, KES for K. E. Steiner and MM for Margie MacPherson. The names of occasional collectors have been given in full.

## KEY TO THE OIL-COLLECTING BEES (MELITTIDAE: *REDIVIVA*) OF THE WINTER RAINFALL REGION

- 1A. Antenna with 10 flagellar segments (females) ..... 2
- 1B. Antenna with 11 flagellar segments (males) ..... 16
- 2A. Mandible tridentate ..... *R. gigas* Whitehead & Steiner
- 2B. Mandible bidentate ..... 3
- 3A. Hind basitarsus with small shiny scale-like projection on distal dorsal angle ..... 4
- 3B. Hind basitarsus with no scale-like projection on distal dorsal angle ..... 7
- 4A. Front coxa with apical hairy spine ..... 5
- 4B. Front coxa without apical hairy spine ..... 6
- 5A. Labrum reddish-brown with shallow depression either side of midline, apical margin angulate ..... *R. bicava* sp. nov.
- 5B. Labrum black shiny with median depression, apical margin straight .....  
..... *R. intermedia* sp. nov.
- 6A. Metasoma with white apical hair bands on T1 to T4, fimbriae of T5 brown. Scale on distal dorsal angle of hind basitarsus small and not always readily discernible. Front basitarsus straight in side view .....  
..... *R. albifasciata* Whitehead & Steiner
- 6B. Metasoma with straw-coloured to light brown diffuse apical hair bands on T2 to T4, fimbriae of T5 of similar colour. Scale on distal dorsal angle of hind basitarsus large and conspicuous. Front basitarsus curved in side view ..... *R. intermixta* Cockerell
- 7A. Forelegs attenuate, length of foretibia plus forebasitarsus greater than 5 mm (total length of foreleg greater than 14 mm) ..... 8
- 7B. Forelegs short, length of front tibia plus basitarsus less than 5 mm (total length of foreleg less than 13 mm) ..... 11

- 8A. Metasomal terga with variable areas of black and light brown integument ..... *R. emdeorum* Vogel & Michener
- 8B. Metasomal terga with entirely black integument ..... 9
- 9A. Body pubescence piceous to black, wings dusky, hairs on front, mid and hind tibia and tarsus and on fimbriae of T6 brown ..... *R. longimanus* Michener
- 9B. Pubescence straw-coloured to light brown ..... 10
- 10A. Metasomal terga T2-T4, with distinct apical hair bands ..... *R. macgregori* sp. nov.
- 10B. Metasomal terga without definite hair bands ..... *R. micheneri* sp. nov.
- 11A. Front coxa with hairy apical spine ..... 12
- 11B. Front coxa lacking apical spine ..... 13
- 12A. Pubescence black ..... *R. ruficornis* sp. nov.
- 12B. Pubescence pale straw-coloured, golden brown on clypeus and supraclypeal area ..... *R. aurata* sp. nov.
- 13A. Scutum with surface between punctures on disc granular, dull ..... *R. peringueyi* (Fries)
- 13B. Scutum with surface between punctures on disc shiny, smooth ..... 14
- 14A. Tarsomeres 2-4 of front leg and 2-3 of middle leg with dense plumose oil-collecting hairs ..... *R. parva* sp. nov.
- 14B. Tarsi of front legs only with dense plumose oil-collecting hairs ..... 15
- 15A. Front legs with dense oil-collecting hairs on tarsomeres 2-4 only. Metasoma with distinct straw-coloured apical hair bands on T2 to T4, short suberect straw-coloured hairs on basal two-thirds of T2-T3, T4 with some black hairs on basal two-thirds. Fimbriae of T5 black basally, brown apically, of T6 dark brown ..... *R. alonsoae* sp. nov.
- 15B. Front legs with oil-collecting hairs on tarsomeres 2-5. Metasoma black and shiny, no distinct apical hair bands. T2-T3 covered with sparse light brown pile, some black hairs basally on T4. Fimbriae of T5-T6 light brown ..... *R. nitida* sp. nov.
- 16A. Distal expanded part of S8 (apical plate) with apical margin straight, slightly concave or at most with shallow emarginations (Figs 63A-F, 64C) ..... 17
- 16B. Apical plate of S8 with distal margin evenly rounded (Figs 63G-H, 64A-B, D) or with deep median emargination on distal margin, dorsal surface concave or flat (Fig. 64E-G) ..... 22
- 17A. Distal margin of apical plate of S8 entire, straight or slightly concave (Fig. 63A, F) ..... 18
- 17B. Distal margin of apical plate of S8 with one to three shallow emarginations (Figs 63B-E, 64C) ..... 19

- 18A. T2-T5 of metasoma with white decumbent apical hair bands, fimbriae of T6 light brown to white, some black hairs basally, fimbriae of T7 light brown, hind tibia light brown, darker central spot on anterior surface. Small bees, body less than 9 mm. S6-S8 and genitalia (Figs 17A-G, 63A) ..... *R. albifasciata* Whitehead & Steiner
- 18B. T2-T5 of metasoma with white to light brown sub-erect hairs, erect black hairs on basal half of T5. Fimbriae of S6 and S7 black to dark brown, hind tibia black. Larger bees, body longer than 10 mm. S6-S8 and genitalia (Figs 55F-G, 57A-E, 63F) ..... *R. alonsoae* sp. nov.
- 19A. Metasoma with integument of T1-T3 having varying amounts of light brown and black. T2-T5 with short erect white apical hair bands, fimbriae of T6 black basally, white apically. Fimbriae of S7 dark brown to black. Hind tibia brown. Large bees, body longer than 10 mm. S6-S8 and genitalia (Figs 25A-G, 63B) ..... *R. emdeorum* Vogel & Michener
- 19B. Metasoma with integument of T1-T4 black, apical hair bands on T2-T5 white to brown, diffuse and suberect or compact and decumbent. Hind tibia brown ..... 20
- 20A. Metasoma with integument of apical third of T3-T4 translucent. Basal segments of front legs mostly black but tarsus and extremities of tibia brown. Pubescence of T1-T3 white to straw-coloured, fimbriae of T6 light brown. Small pygidal plate medially on apical margin of T7. S6-S8 and genitalia (Figs 44A-H, 63C-D) ..... *R. aurata*, *R. ruficornis* spp. nov.
- 20B. Metasoma with integument of T3-T4 entirely black. Tarsus of front leg brown, rest of leg dark brown to black. T1-T3 with hairs of basal half light straw-coloured or black. Fimbriae of T6 light brown to black. Pygidal plate absent ..... 21
- 21A. Small bees, body 8-10 mm. Apical plate of S8 subtriangular, lateral margins diverging distally, apical margin shallowly crenulate or shallowly concave if worn (Fig. 63E). Distinct white apical hair bands on T2-T4, basal two-thirds of T3-T4 with short, black decumbent hair. Integument of hind tibia and basitarsus brown. S6-S8 and genitalia (Fig. 52A-G) .... *R. parva* sp. nov.
- 21B. Larger bees 10-12 mm. Apical plate ovate, distal margin shallowly crenulate (Fig. 64C). Diffuse apical hairbands on T2-T4, basal half of T3-T4 with pale straw-coloured sub-erect hairs. Integument of hind tibia and basitarsus black. S6-S8 and genitalia (Figs 32A-E, 33D-E) ..... *R. macgregori* sp. nov.
- 22A. Distal margin of apical plate of S8 with deep median emargination (Fig. 64E-G) ..... 23
- 22B. Distal margin of apical plate of S8 evenly rounded (Figs 63G-H, 64A-B, D) ..... 25
- 23A. S8 expanded apically in the form of a fish tail, deeply cleft medially, (Figs 5A-G, 64G). Large bees, body greater than 13 mm. Pubescence



- light to reddish-brown, apical hair bands with pale tips on T2–T5 .....  
 ..... *R. gigas* Whitehead & Steiner
- 23B. Apical plate of S8 ovoid to sub-circular with median emargination on  
 distal margin (Fig. 64E–F) ..... 24
- 24A. Apical plate of S8 ovoid, deep median emargination on distal margin  
 (Fig. 64E). Small bees, body less than 9 mm. White apical hair bands on  
 T2–T4, brown on T5, fimbriae on T6 and T7 light brown .....  
 ..... *R. bicava* sp. nov.
- 24B. Apical plate of S8 sub-circular, longer than wide with deep median  
 emargination on distal margin (Fig. 64F). Medium-sized bees 8–11 mm.  
 Erect straw-coloured hairs on metasoma, fimbriae of T6 light brown .....  
 ..... *R. intermixta* Cockerell
- 25A. Apical plate of S8 concave, elongate, width less than half of length  
 (Fig. 63G–H, 64A) ..... 26
- 25B. Apical plate of S8 concave, ovoid, width at least two-thirds of length  
 (Fig. 64B, D) ..... 28
- 26A. Scutum with surface between punctures granulate. Small median pygideal  
 plate on apical margin of T7. Apical area of S6 concave without tuft of  
 erect black hairs on proximal margin of concavity. Hind tibia lacking  
 distal black patch of hair on outer surface ..... *R. longimanus* Michener
- 26B. Scutum with surface between punctures on disc smooth and shiny. T7  
 without median pygideal plate on apical margin. Apical area of S6  
 concave with or without tuft of erect black hairs on proximal margin of  
 concavity. Hind tibia with or without distal black patch of hair on outer  
 surface ..... 27
- 27A. Pubescence of T5 black. Hind tibia with distal patch of black hairs on  
 outer surface ..... *R. nitida* sp. nov.
- 27B. Pubescence of T5 black with apical fringe of white to silvery hair. No  
 distal patch of dark hair on outer surface of hind tibia .....  
 ..... *R. micheneri* sp. nov.
- 28A. Scutum with surface between punctures granulate .....  
 ..... *R. peringueyi* (Friese)
- 28B. Scutum with surface between punctures smooth and shiny .....  
 ..... *R. intermedia* sp. nov.

## DESCRIPTIONS

*Rediviva gigas* Whitehead & Steiner, 1993

Figs 2G–H, 3–6, 64G

*Rediviva gigas* Whitehead & Steiner, 1993: 159.

### Diagnosis

*Females.* Large, 15–17 mm long, integument black, wings dusky, vestiture on head and mesosoma varies from pale straw-coloured to reddish-brown. Apical hair bands on metasomal terga not prominent, white on disc becoming black laterally, fimbriae black. Malar space short, mandible tridentate. Foreleg not attenuate, three-quarters length of body, oil-collecting hairs on distal part of front basitarsus. Scopal hairs on hind tibia and basitarsus black.

*Males.* Body 13–15 mm, integument black, wings dusky, hairs on head, mesosoma and epipleurae pale straw-coloured to reddish-brown. Apical hairbands on T1–T5 light brown basally, white apically, fimbriae on T6 light brown, on T7 black. Mandible bidentate, malar space short. S7 without lateral lobes, apex of S8 expanded, distal margin with deep median cleft.

### Etymology

From Latin, *gigas*, a giant, referring to the large size of members of this species.

### Material examined

*Type material.* *Holotype:* SAM-HYM-B000005, female, Western Cape Province, Franschhoek Pass, 560 m, 3119CC, K. E. Steiner, 30 Nov. 1990. *Allotype:* SAM-HYM-B000006, male, Western Cape Province, Franschhoek Pass, 3319CC, K. E. Steiner, 10 Dec. 1991. *Paratypes:* (14 ♀♀, 1 ♂)—*Western Cape Province:* 1 ♂, Bain's Kloof, 3119CA, KES, 11 Nov. 1986; 1 ♀, Bot River, farm Huisrivier, 3419AA, VBW, 11 Nov. 1990; 2 ♀♀, Franschhoek Pass, 560 m, 3319CC, KES, 18 Dec. 1989; 1 ♀, Franschhoek Pass, 3319CC, KES, 6 Dec. 1981; 5 ♀♀, Franschhoek Pass, 5 km north of Dutoit's River bridge, 3319CC, VBW, 13 Dec. 1989; 4 ♀♀, Franschhoek Pass, 5 km north of Dutoit's River bridge, 3319CC, VBW, 14 Dec. 1989; 1 ♀, Franschhoek Pass, 560 m, 3319CC, VBW, 6 Dec. 1991. *Other material* (10 ♀♀, 9 ♂♂): 4 ♀♀, Betty's Bay, 3418BD, VBW, 4 Nov. 1993; 2 ♀♀, Betty's Bay, 3418BD, VBW, 4 Nov. 1998; 1 ♀, Porterville, farm Grootfontein, 3219CC, KES, 19 Oct. 1994; 2 ♂♂, Porterville, farm Grootfontein, 3219CC, VBW, 19 Oct. 1994; 6 ♂♂, Porterville, farm Grootfontein, 3219CC, VBW, 17 Oct. 1995; 1 ♀, Porterville, farm Grootfontein, 3219CC, VBW, 23 Oct. 1995; 2 ♀♀, 1 ♂, Porterville, farm Grootfontein, 3219CC, VBW, 11 Nov. 1996.

### Description

#### Female

*Measurements.* *Holotype:* body 16.8 mm, forewing 13.3 mm. *Other material* (n = 10). *Measurements and ranges:* body 16.4 mm (15.3–17.2 mm), foreleg 12.9 mm (12.5–13.3 mm), Ft+bt 4.9 mm (4.5–5.1 mm), forewing 13.1 mm (12.2–13.8 mm). *Ratios:* FL : B 0.79 (0.50–0.82), malar space L : W 0.14 (0.12–0.15).

*Integumental colour.* Black, tip of mandible, apical margins of T2–T4, distal part of front femur, outer margin of tegula piceous; tarsomeres 2–4, claws, tibial spurs and costal vein dark brown. Underside of flagellum dark brown, colour sometimes extending to upper surface.

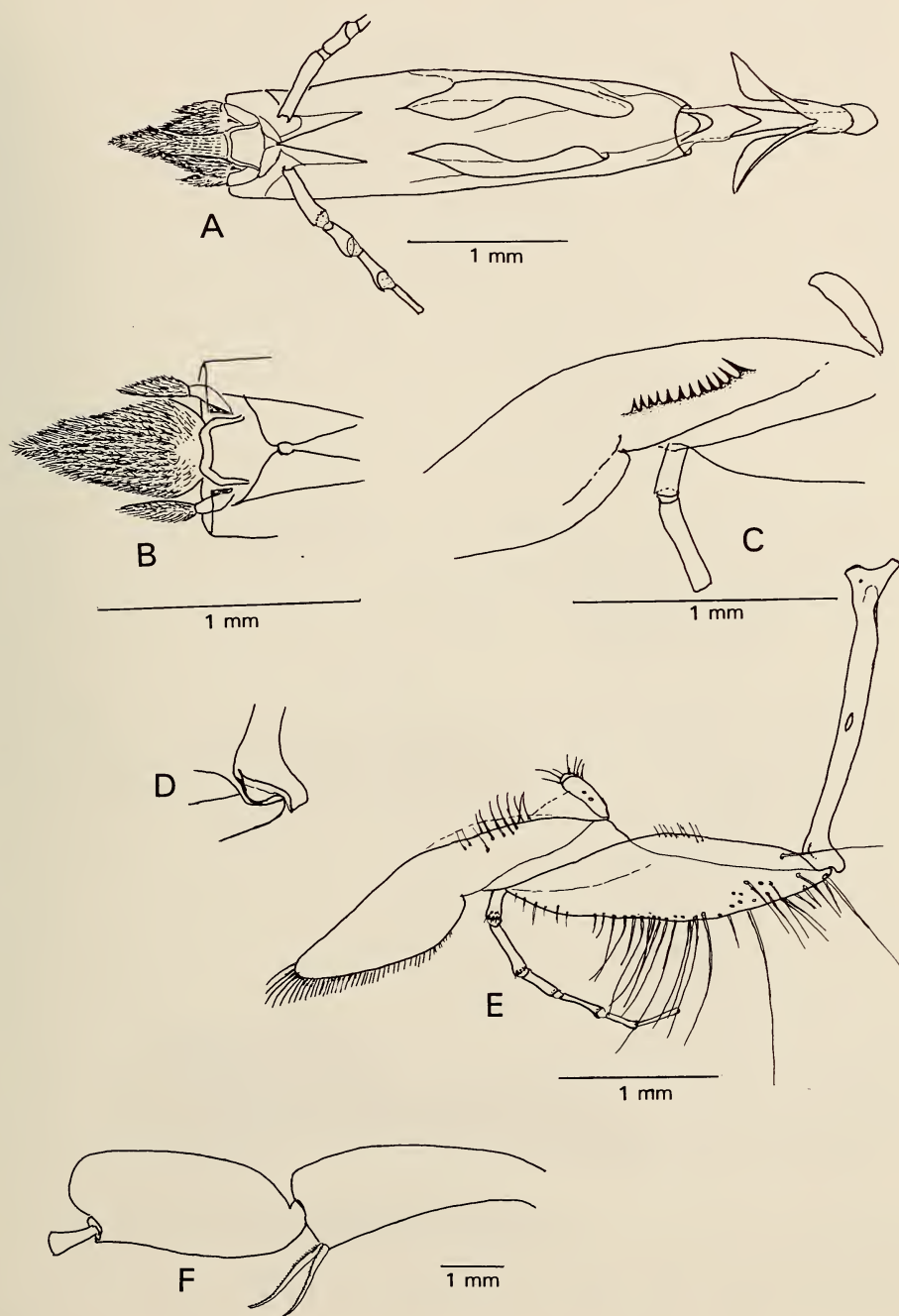


Fig. 3. *Rediviva gigas* Whitehead & Steiner, 1993. Female. A. Posterior view of labium. B. Anterior view of distal part of labium. C. Comb on inner side of galea. D. Basistipital process. E. Outer view of maxilla. F. Posterior view of hind tibia and basitarsus (pile removed).



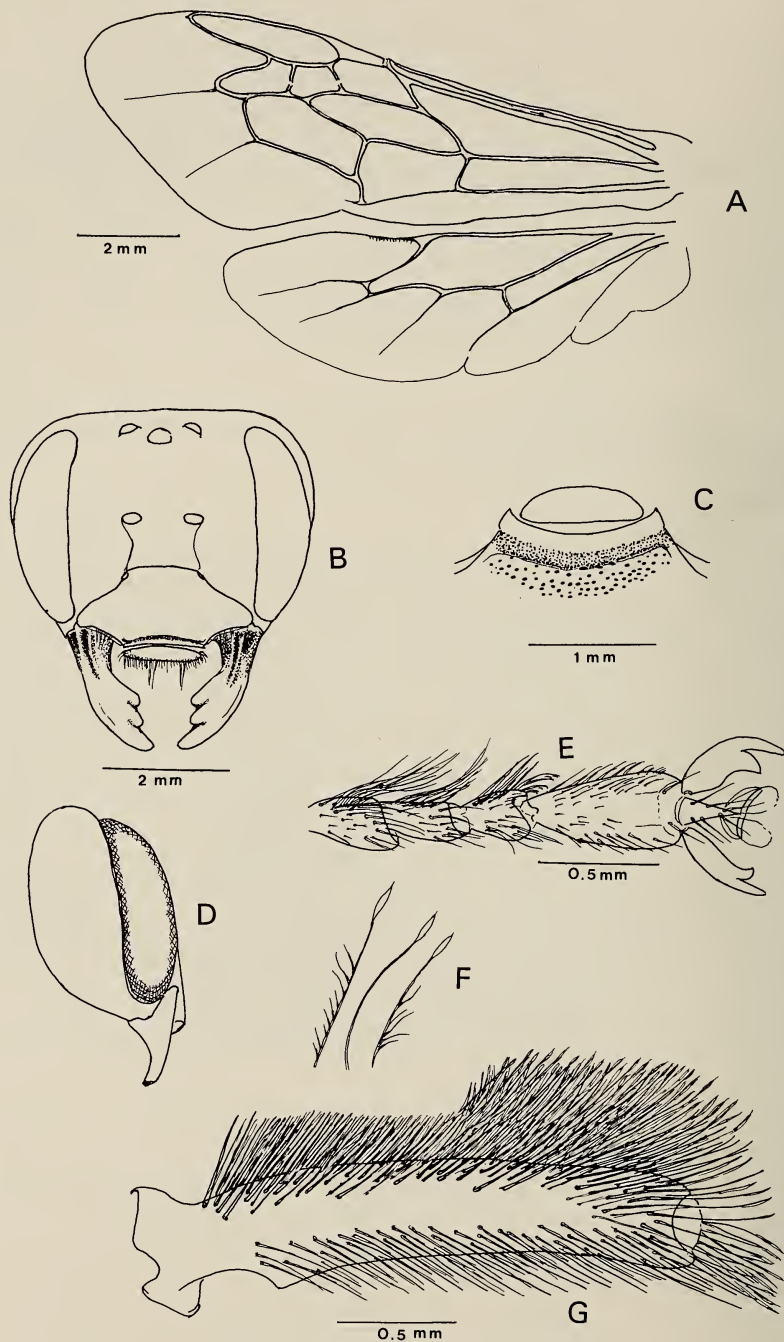


Fig. 4. *Rediviva gigas* Whitehead & Steiner, 1993. Female. A. Left front and hind wings. B. Anterior view of head. C. Labrum and distal region of clypeus. D. Side view of head. E. Dorsal view of tarsomeres 2-5 of front leg. F. Lanceolate-tipped plumose hairs of forebasitarsus. G. Anterior view of forebasitarsus (pile partially removed).

*Structure.* Head: ocelli well below horizon of vertex (Fig. 4B), clypeus coarsely and densely punctured, some smaller punctures interspersed among larger, surface between punctures shiny. Mouth-parts: glossa short, triangular, one-third length of prementum, paraglossa longer than suspensorium, reaching middle of glossa, labial palps extending beyond tip of glossa, ligular arms occupying basal two-thirds of prementum (Fig. 3A–B); cardo and stipes equal length, stipes three times as long as wide, posterior margin with long hairs, galea rounded at apex, stout hairs along apical and posterior margins (Fig. 3E); galeal comb of 12 teeth (Fig. 3C) (incorrectly referred to as stipital comb in Whitehead & Steiner 1993); mandible broad apically, tridentate (Fig. 4B); labrum three times as broad as long. Mesosoma: foreleg not attenuate, four-fifths length of body; hind tibia nearly as wide as basitarsus (9 : 10), basitarsus nearly half as wide as long (20 : 44), evenly rounded distally, without scale-like projection on distal dorsal angle (Fig. 3F); wings fuscous, jugal lobe of hind wing slightly longer than half vannal lobe (16 : 30) (Fig. 4A); scutellum with shallow median longitudinal depression; propodeal triangle small, ill defined, width at base one-fifth to one-sixth distance between metanotal pits.

*Sculpture.* Head: area between anterior margin and preapical ridge of clypeus finely roughened, rest of clypeus coarsely and densely punctured, punctures sometimes coalescing, surface between punctures shiny except on apical margin and paraocular areas adjacent to antennal sockets where surface is faintly coriaceous. Mesosoma: disc of scutum shiny, finely punctured, rest of scutal punctures more coarse and dense.

*Vestiture.* Head: labrum with stout unbranched dark brown to black hairs, longer and light brown distally; stout dark brown plumose hairs along clypeal lateral margins, rest of clypeus and supraclypeal area sparsely covered with dark brown unbranched pubescence; genal area with mixture of branched and unbranched hairs, longer and more dense towards mandible. Mesosoma: erect black branched hairs on margin of scutum, shorter towards disc which is bare; scutellum and metanotum with white pubescence on margins, black shorter hairs towards center, disc of scutum and scutellum bare; episternum with long black vestiture, shorter and less dense towards sternal midline; hairs on legs black except anterior brush of strong dark brown hair on basitarsus and tibia of foreleg; front leg with stout curved blade-like hairs on lateral margins of tarsomeres 2–4, some slender straight hairs with lanceolate tip and fine basal branching on tarsomere 2; apical third of forebasitarsus with long slender branched lanceolate tipped hairs (Fig. 4E–G); scopal hairs on tibia and basitarsus of hind leg black. Metasoma: white to pale brown sparse apical hairbands on T1–T4, often worn on dorsal midline, fimbriae of T5–T6 black.

### *Male*

*Measurements and ranges* (n = 10). Body 14.0 mm (12.0–15.2 mm), foreleg 10.4 mm (8.8–10.8 mm), forewing 11.1 mm (10.7–11.5 mm), Ft+bt 3.5 mm (2.9–3.8 mm). *Ratios*: FL : B 0.75 (0.68–0.80), malar space L : W 0.09 (0.08–0.11).

*Integumental colour.* Body black, legs black except hind tibia which is dark brown on dorsal and ventral margins, tarsi light brown; antennae black, junctions of flagellomeres 1 and 2 brown on dorsal surface, colour sometimes

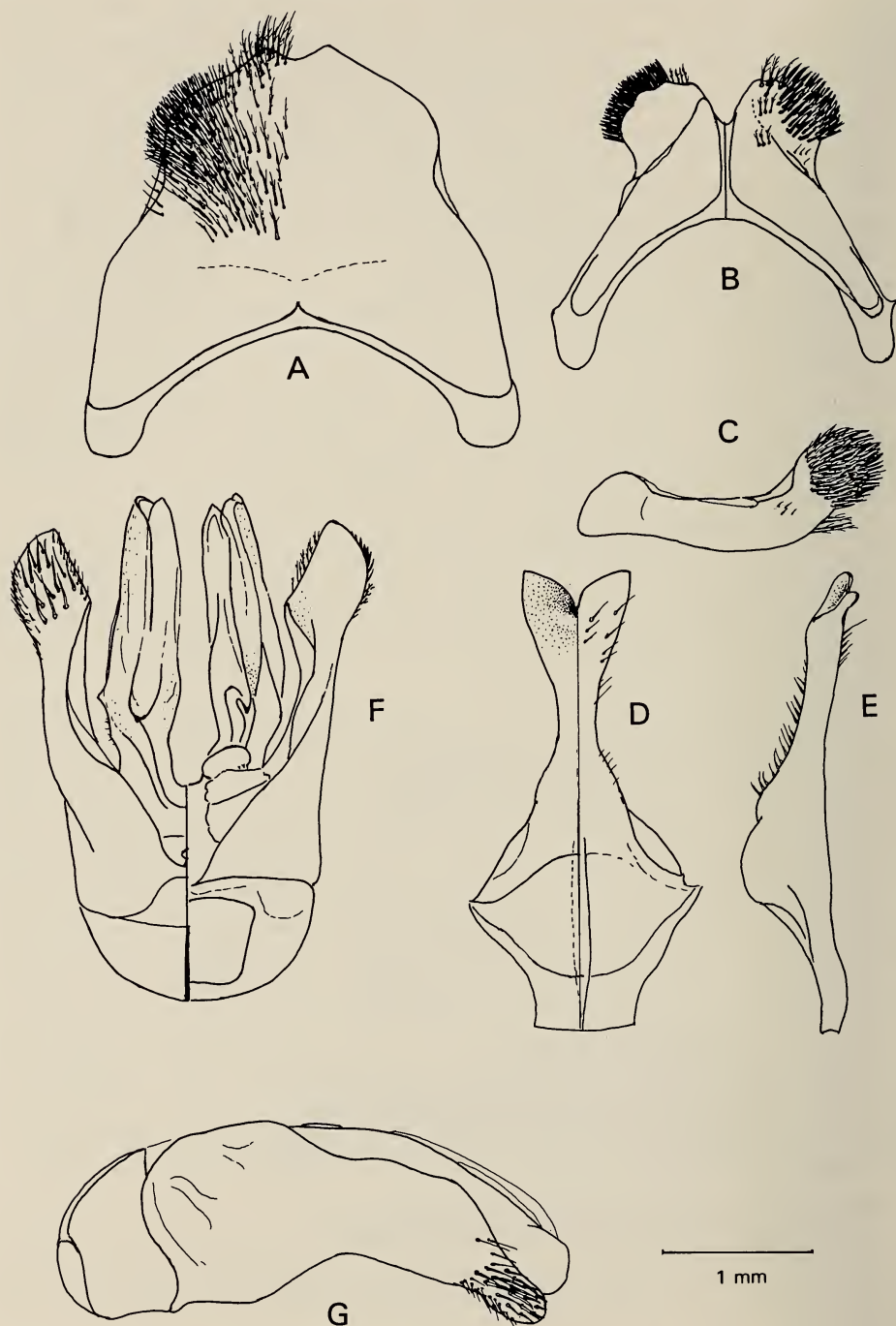


Fig. 5. *Rediviva gigas* Whitehead & Steiner, 1993. Male. Genitalia and associated sterna. A. S6, ventral view. B. S7, dorsal view left, ventral right. C. S7, lateral view. D. S8, dorsal view left, ventral right. E. S8, lateral view. F. Genitalia, dorsal view left, ventral view right. G. Genital capsule, lateral view.



extending to whole of two on underside, underside of terminal flagellomeres reddish-brown to black.

**Structure.** Head: wider than long, mandible bidentate. Mesosoma: foreleg not attenuate, three-quarters length of body, hind tibia wider than basitarsus (26 : 15), wing venation as in female. Metasoma: S3–S5 with apical margin biconcave forming a median point, S6 apical margin raised (Fig. 5A), emarginate, forming small median lobes, lateral lobes poorly developed; S7 (Fig. 5B–C) deeply emarginate apically, large rounded median lobes directed dorsally, stout bristle-like hairs on outer surface, smooth and shiny on inner surface, lateral lobes absent; S8 (Fig. 5D–E) expanded apically, apical margin deeply cleft (Fig. 64G); genital capsule (Fig. 5F–G) with gonoforceps slightly shorter than penis valve, former having stout finely branched apical hairs.

**Sculpture.** Head: base of labrum impunctate, shiny; anterior clypeal margin with large irregular punctures, rest of clypeus, supraclypeal and paraocular area coarsely punctate, surface between punctures smooth, shiny. Mesosoma: scutum densely punctured, distance between punctures less than diameter, surface between punctures shiny, smooth.

**Vestiture.** Head: dense unbranched pale brown hairs on labrum, pale straw-coloured plumose hairs on clypeus, paraocular and supraclypeal areas; short sparse hairs on vertex, tufts between lateral ocelli. Mesosoma: scutum, scutellum and metanotum covered with pale plumose pubescence, sparser on disc of scutum and scutellum, longer and sparse on propodeum, propodeal triangle bare; coxa, trochanter and femur with long straw-coloured hairs, shorter on tibia and tarsus. Metasoma: dense pale yellow apical hair bands on T1–T5, fimbriae on T6 and T7 black. S1–S5 with sparse light brown apical bands, dark brown to black tufts on lateral apical angles of S5, emargination on apical margin of S6 with dense plumose hairs.

#### *Colour variations*

Pubescence on mesosoma of females varies from pale straw-coloured to reddish-brown to black. Males have predominantly pale straw-coloured pubescence but reddish-brown specimens also occur.

#### *Host flower records*

Initially females were found to collect oil only from three terrestrial orchid species, namely *Pterygodium acutifolium*, *Ceratandra atrata* and *C. bicolor* (Whitehead & Steiner 1993). More recently a fourth orchid, *Satyrium rhynchanthum* at Betty's Bay, and *Ixianthes retzioides* (Scrophulariaceae), a rare shrub in the Porterville area, were found to be visited for oil (Steiner & Whitehead 1996).

Pollen is deposited passively on the scutum of females when they visit *I. retzioides* for oil collection and also obtain pollen from *Wachendorfia paniculata*, *Watsonia marginata* and *Moraia ramosissima* in the process of collecting nectar. At two localities we have observed females actively collecting pollen from *Watsonia borbonica* and *W. marginata* by scrubbing the anthers with their legs. Males take nectar from *Wachendorfia paniculata*, *Watsonia marginata* and *M. ramosissima*.

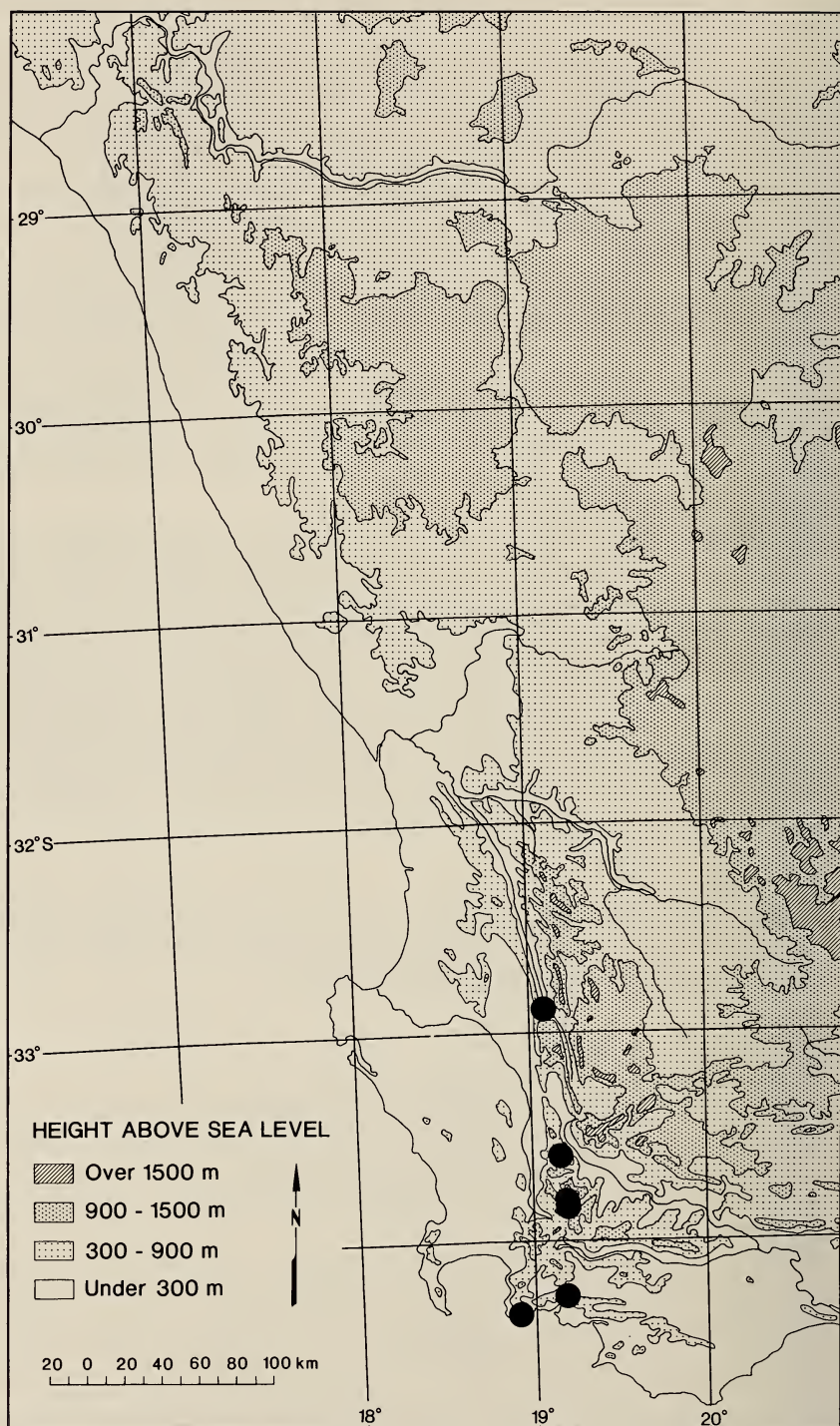


Fig. 6. Known distribution of *Redivia gigas*.

*Distribution* (Fig. 6)

*Rediviva gigas* is known from a limited area in the mountainous south-western Cape Province, from Porterville in the north, southwards to Bain's Kloof and Franschhoek passes, and the coastal areas at Botrivier and Betty's Bay.

*Rediviva bicava* sp. nov.

Figs 1E, 7–10, 64E

*Diagnosis*

*Female*. Small dark brown to black bees 8–11 mm long, pubescence white to straw-coloured, apical hair bands on terga of metasoma. Labrum reddish-brown, shallow concavities either side of the midline. Conspicuous scale on distal dorsal angle of hind basitarsus, distal margin of hind basitarsus truncate, not extending beyond insertion of tarsomere 2.

*Male*. Small, 8–9 mm long, apical hair bands on metasoma not as distinct as in females, vestiture white. Labrum impunctate, black, shiny. Scutum with surface between punctures roughened. S6 reddish-brown, median lobes of S7 narrow, lateral lobes small, translucent.

*Etymology*

From Latin *bi* and *cavus*, concave or hollow, referring to two shallow depressions, one either side of the midline of the labrum of females.

*Material examined*

*Type material*. *Holotype*: SAM-HYM-B008066, female, Northern Cape Province, Nieuwoudtville Wild Flower Reserve, 3119AC, K. E. Steiner, 28 Aug. 1984. *Allotype*: SAM-HYM-B000068, male, Northern Cape Province, Nieuwoudtville Wild Flower Reserve, 3119AC, V. B. Whitehead, 2 Aug. 1984. *Paratypes*: (40 ♀♀, 8 ♂♂)—*Northern Cape Province*: 3 ♀♀, 1 ♂, Kamiesberg, farm Bakleikraal, 3018AA, KES, 19 Aug. 1988; 2 ♂♂, Kamieskroon, 4 km north on Gamoep road, 3018AA, MM & VBW, 28 Aug. 1985; 1 ♀, Nieuwoudtville Wild Flower Reserve, 3119AC, KES, 28 Aug. 1984; 1 ♂, same locality, MM & VBW, 28 Aug. 1985; 1 ♂, same locality, VBW, 2 Aug. 1984; 1 ♂, same locality, VBW, 19 Aug. 1986; 1 ♀, Richtersveld National Park, Hellskloof Pass, 2817AC, VBW, 27 Aug. 1986; 1 ♀, Sutherland, 4 km south, 3220BC, KES, 27 Sept. 1984; 2 ♀♀, Sutherland, farm Rooikloof, 3220BC, KES, 1 Oct. 1986. *Western Cape Province*: 3 ♀♀, Amalienstein, Seweweekspoort, 3321AD, KES, 10 Sept. 1985; 1 ♀, Bitterfontein, 3118AB, KES, 26 Aug. 1986; 3 ♀♀, 1 ♂, same locality, VBW, 26 Aug. 1986; 1 ♀, Calitzdorp, Rooiberg Pass, 3221DA, KES, 15 Aug. 1985; 2 ♀♀, same locality, VBW, 2 Aug. 1987; 4 ♀♀, Cape Town, Tygerberg Hills, 3318DC, KES, 26 Sept. 1987; 2 ♀♀, Clanwilliam 7 km south, 3218BB, MM, 3 Sept. 1986; 1 ♀, Clanwilliam, Ramskop Camp Ground, 3218BB, VBW, 20 Aug. 1985; 1 ♀, Darling, farm Oudebos, 3318AD, KES, 8 Sept. 1989; 2 ♀♀, Darling, farm Rondeberg, 3318AC, KES, 2 Sept. 1988; 3 ♀♀, De Doorns, farm Appaskop,



3319BC, VBW, 24 Sept. 1992; 3 ♀♀, Worcester, Karoo Gardens, 3319CD, KES, 18 Aug. 1989; 4 ♀♀, Montagu, farm Rietvlei No. 1, 3320CC, VBW, 28 Aug. 1987; 1 ♀, Moorreesburg, farm Neulfonteinskop, 3318BA, VBW, 7 July 1985; 1 ♀, same locality, 23 Aug. 1988; 1 ♀, Nuwerus, 3118AB, KES, 8 Aug. 1985; 1 ♀, same locality, VBW, 8 Aug. 1985; 1 ♀, Oudtshoorn, 7 km south, 3322CA, VBW, 2 Sept. 1992; 1 ♀, Oudtshoorn, Schoemanspoort, 3322AD, KES, 11 Sept. 1985; 1 ♀, same locality, VBW, 11 Sept. 1985; 2 ♀♀, Swellendam, Bontebok National Park, 3420AC, VBW, 30 Sept. 1987; 3 ♀♀, Yzerfontien, 12 km south-east, 3318AD, VBW, 22 Sept. 1988. *Other material—Northern Cape Province* (64 ♀♀): 2 ♀♀, Gargams, 7.7 km north-east, 3321DA, KES, 15 Aug. 1985; 1 ♀, Garies, Wallekraal, 3017BA, VBW, 3 Aug. 1988; 4 ♀♀, Kamiesberg, farm Bakleikraal, 3018AA, KES, 19 Aug. 1988; 3 ♀♀, same locality, VBW, 19 Aug. 1988; 1 ♀, Kamiesberg, farm Dassiefontein, 3017BB, KES, 8 Sept. 1986; 2 ♀♀, Kamieskroon, 4 km north on Gamoep road, 3018AA, MM & VBW, 24 Aug. 1985; 2 ♀♀, same locality, MM & VBW, 28 Aug. 1985; 1 ♀, Karkams, 3017BD, VBW, 8 Aug. 1985; 2 ♀♀, Karkams, 6 km east, 3017BD, VBW, 28 July 1985; 1 ♀, Karkams, 8 km east, 3017BD, 28 July, 1985; 1 ♀, Karkams, 3017BD, MM & VBW, 22 Aug. 1985; 1 ♀, Middelpoort, 35 km north-west, 3119DD, VBW, 25 Sept. 1984; 1 ♀, Nieuwoudtville Wild Flower Reserve, 3119AC, KES, 27 Aug. 1984; 5 ♀♀, same locality, KES, 28 Aug. 1984; 2 ♀♀, same locality, KES, 11 Sept. 1984; 3 ♀♀, same locality, KES, 31 July 1985; 6 ♀♀, same locality, KES, 27 Aug. 1985; 6 ♀♀, same locality, KES, 28 Aug. 1985; 4 ♀♀, same locality, KES, 9 Sept. 1986; 1 ♀, same locality, MM & VBW, 28 Aug. 1985; 2 ♀♀, Springbok, 20 km south, 2917DB, VBW, 10 Aug. 1985; 1 ♀, Springbok, Goegab Reserve, 2918DB, KES, 13 Aug. 1993; 1 ♀, same locality, VBW, 24 Aug. 1993; 1 ♀, Springbok, Hester Malan Reserve, 2917DB, M. Struck, 13 Sept. 1987; 1 ♀, same locality, VBW, 23 Aug. 1990; 1 ♀, Springbok, Spektakel Pass, 2917DA, VBW, 9 Aug. 1985; 1 ♀, Sutherland, Kanolfontein, 3220AD, KES, 22 Sept. 1985; 7 ♀♀, Sutherland, Ouberg Pass road, 3220AA, VBW, 1 Oct. 1986. *Western Cape Province* (229 ♀♀): 8 ♀♀, Amalienstein, Seweweekspoort, 3321AD, KES, 10 Sept. 1985; 4 ♀♀, same locality, VBW, 10 Sept. 1985; 6 ♀♀, Calitzdorp, Rooiberg Pass, 3321DA, KES, 15 Aug. 1985; 4 ♀♀, same locality, VBW, 15 Aug. 1985; 2 ♀♀, same locality, VBW, 2 Aug. 1987; 1 ♀, Bitterfontein, 3118AB, KES, 26 Aug. 1986; 1 ♀, same locality, VBW, 26 Aug. 1986; 8 ♀♀, Cape Town, Tygerberg Hills, 3318DC, KES, 26 Sept. 1989; 2 ♀♀, same locality, KES, 14 Sept. 1990; 1 ♀, same locality, KES, 1 Oct. 1990; 1 ♀, same locality, VBW, 1 Oct. 1990; 1 ♀, Clanwilliam, farm Klawervlei, 3218DD, VBW, 20 Aug. 1984; 2 ♀♀, Clanwilliam, Pakhuis Pass, 3219AA, KES, 22 Sept. 1990; 2 ♀♀, De Doorns, farm Appaskop, 3319BC, VBW, 24 Sept. 1992; 2 ♀♀, Hex River Pass, 3319BD, KES, 1 Oct. 1985; 2 ♀♀, Hex River Pass, 3319BD, VBW, 1 Oct. 1985; 3 ♀♀, same locality, VBW, 18 Oct. 1989; 1 ♀, same locality, KES, 18 Oct. 1989; 2 ♀♀, Klawer, 7 km north-east, 3118DA, VBW, 11 Aug. 1989; 1 ♀, Klawer, farm Zyperfontein, 3118DC, KES, 11 Aug. 1989; 2 ♀♀, same locality, KES, 12 Aug. 1989; 3 ♀♀, same locality, KES, 22 Aug. 1989; 1 ♀, Ladismith, junction R626 and R323, 3321CA, KES, 16 Aug. 1995; 1 ♀, Langebaan, 3318AA, VBW, 20, Aug. 1986; 1 ♀, Middelpoort, farm Hartbeestfontein,

3220CC, VBW, 25 Sept. 1984; 1 ♀, Montagu, 40 km north-east, 3320DA, VBW, 15 Sept. 1992; 1 ♀, Montagu, Kogmanskloof, 3320CC, VBW, 1 Sept. 1992; 2 ♀♀, Montagu Nature Reserve, 3320CC, KES, 9 Aug. 1990; 11 ♀♀, Montagu, farm Rietvlei No. 1, 3320CC, VBW, 26 Aug. 1987; 1 ♀, Nuwerus, 3118AB, KES, 8 Aug. 1985; 2 ♀♀, same locality, VBW, 8 Aug. 1985; 1 ♀, Nuwerus, Meerhofkasteel road, 3118AA, VBW, 21 Aug. 1991; 4 ♀♀, Oudtshoorn, 7 km south, 3322CA, VBW, 2 Sept. 1992; 3 ♀♀, Oudtshoorn, Schoemanspoort, 3322AD, KES, 11 Sept. 1985; 2 ♀♀, same locality, VBW, 11 Sept. 1985; 1 ♀, Riebeek-Kasteel, Bothmaskloof Pass, 3318BD, KES, 17 Sept. 1987; 1 ♀, Riebeek-Kasteel, Bothmaskloof Pass, 3318BD, VBW, 17 Sept. 1987; 2 ♀♀, Stellenbosch, Bothmaskop, 3318DD, VBW, 6 Oct. 1985; 1 ♀, same locality, VBW, 4 Oct. 1987; 1 ♀, Stellenbosch, farm Joostenbergkloof, 3318DD, KES, 16 Sept. 1987; 2 ♀♀, same locality, VBW, 16 Aug. 1988; 1 ♀, Swellendam, Bontebok National Park, 3420AC, KES, 29 Sept. 1987; 1 ♀, same locality, VBW, 29 Sept. 1987; 1 ♀, Vanrhyns Pass, 3118AC, KES, 7 Aug. 1986; 1 ♀, Vanrhynsdorp, Wiedows River, 3318DA, VBW, 11 Aug. 1985; 1 ♀, same locality, VBW, 13 Aug. 1986; 1 ♀, West Coast National Park, 3318DA, VBW, 17 Sept. 1985; 1 ♀, same locality, KES, 5 Sept. 1990; 5 ♀♀, Worcester, Karoo Gardens, 3319CD, VBW, 9 Sept. 1985; 13 ♀♀, same locality, KES, 18 Aug. 1989; 3 ♀♀, same locality, KES, 3 Oct. 1989; 2 ♀♀, Yzterfontein, 12 km south-east, 3318AD, VBW, 29 Sept. 1988.

## *Description*

### *Female*

*Measurements. Holotype:* body 9.8 mm, forewing 7.5 mm, malar space L : W 0.35. *Other material* (n = 50)—*Measurements and ranges:* body 9.9 mm (8.8–11.0 mm), foreleg 8.8 mm (8.1–9.8 mm), Ft+bt 2.9 mm (2.8–3.0 mm), forewing 7.8 mm (7.2–8.2 mm). *Ratios:* FL : B 0.90 (0.77–1.03), malar space (n = 10) L : W 0.34 (0.30–0.38).

*Integumental colour.* Head: labrum, anterior margin of clypeus, flagellum reddish-brown, rest of head black. Mesosoma: black, legs, tegulae, veins brown, except R which is black; wings dusky. Metasoma black.

*Structure.* Head: wider than long (114: 80), (Fig. 8A); malar space relatively long, one-third width. Mouth-parts (Fig. 7A–G): labrum (Fig. 8B) triangular, twice as wide as long (44: 20), shallow concave depression either side of midline; glossa one-third length of prementum, not extending beyond labial palps; paraglossae small, half length of suspensorium; ligular arms occupying basal two-thirds of prementum (Fig. 7A–D); cardo slightly shorter than stipes, three and a half times as long as wide (Fig. 7E); galeal comb of 15 teeth (Fig. 7G). Mesosoma: front coxa with stout inner apical spine (Fig. 8E); hind tibia (Fig. 8C) as wide as basitarsus; basitarsus twice as long as wide, truncated, not extending beyond insertion of tarsomere 2, conspicuous scale on distal dorsal angle.

*Sculpture.* Head: basal two-thirds of labrum impunctate, shiny; clypeus with apical margin impunctate, rest of clypeus with contiguous coarse punctures, irregularly shaped median impunctate area, surface between punctures lightly roughened. Mesosoma: scutum with scattered large punctures among finer

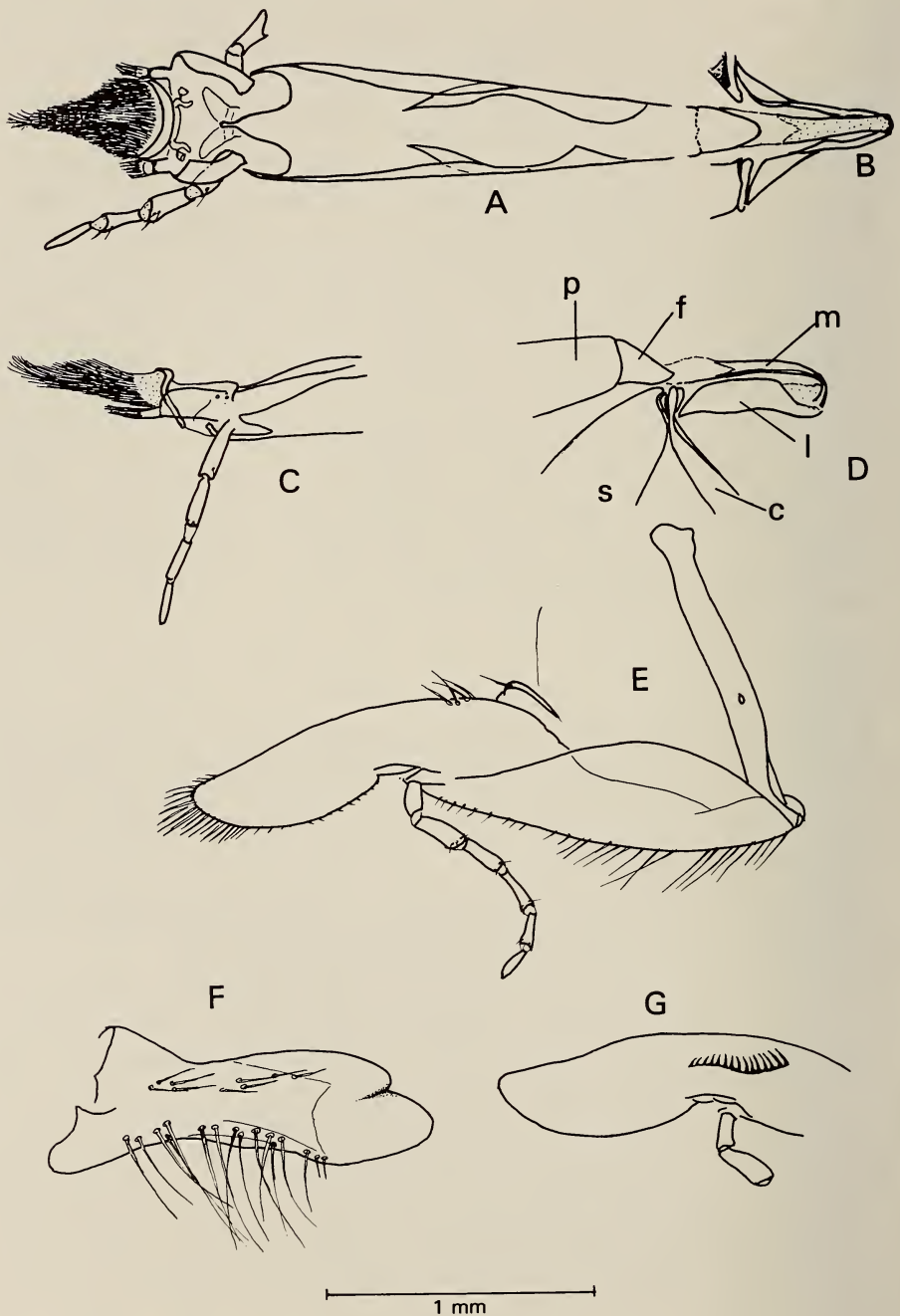


Fig. 7. *Rediviva bicava* sp. nov. Female. A. Labium, anterior view. B. Posterior aspect of base of prementum. C. Lateral aspect of apex of labium. D. Lateral view of base of prementum, mentum, lorum and associated sclerites. E. Left maxilla. F. Right mandible. G. Inner view of galea to show comb.



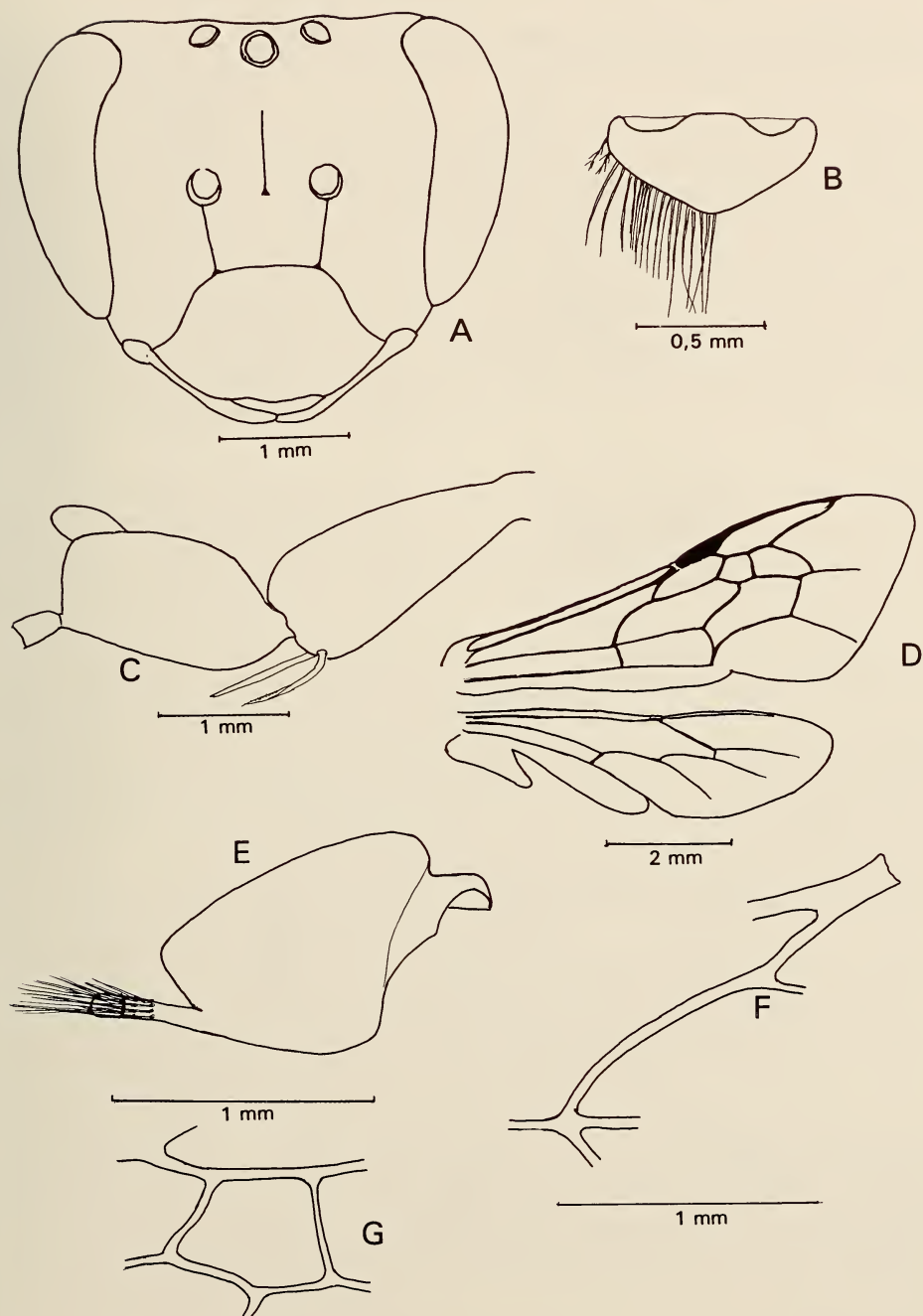


Fig. 8. *Rediviva bicava* sp. nov. Female. A. Front view of head. B. Labrum. C. Hind tibia and basitarsus. D. Right wings. E. Right front coxa. F. Basal vein and first abscissa of Rs of front wing. G. Second submarginal cell of right front wing.

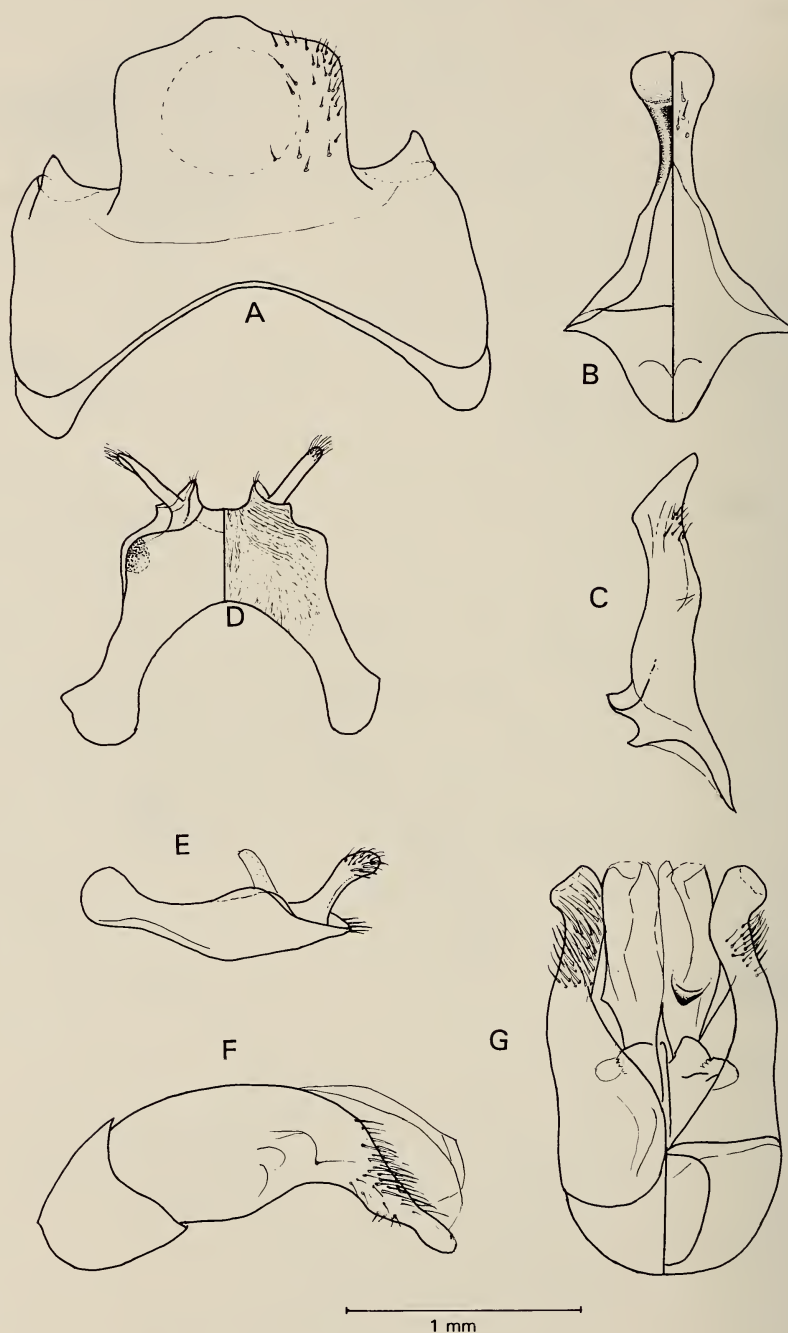


Fig. 9. *Rediviva bicava* sp. nov. Male. A. S6, ventral aspect. B. S8, dorsal and ventral view. C. S8, lateral view. D. S7, dorsal and ventral view. E. S7, lateral aspect. F. Genital capsule, lateral view. G. Genitalia, dorsal and ventral aspects.

punctuation, finer on disc, punctures approximately diameter apart, area between smooth, shiny. Propodeal triangle small, well defined, surface wrinkled, rest of propodeum coriaceous.

**Vestiture.** Head: labrum with fringe of long brown hair on apical margin; clypeus having mixture of long dark sparsely branched and short white plumose hairs; similar but more dense on paraocular areas, frons and vertex. Mesosoma: scutum with short light brown pubescence, some black branched hairs on margin, longer on scutellum and metanotum, dark hairs absent from propodeum; coxa, trochanter and femur of all legs with white plumose hairs, light brown shorter hairs on tibia and tarsus; oil-collecting hairs on tarsomeres 2, 3 and 4 of front and middle legs. Metasoma: white apical hair bands on T2–T4, black sub-erect hairs on base of T4, fimbriae of T5 brown basally, white laterally, fimbriae of T6 brown.

### Male

**Measurements.** Allotype: male, body 8.3 mm, forewing 7.7 mm, malar space L : W 0.36. Other material (n = 2)—Measurements and ranges: body 8.7 mm (8.5–8.8 mm), forewing 7.8 mm (7.7–8.0 mm), foreleg 7.8 mm (7.6–8.0 mm). Ratios: FL : B 0.9 (8.6–9.4), malar space L : W 0.43 (0.42–0.43).

**Integumental colour.** Head: antennae black, except flagellum which is dark brown underneath, mouth-parts piceous. Mesosoma: black, coxa, trochanter and femur brown. Metasoma: black except S6 which is brown.

**Structure.** Head: anterior margin of labrum evenly convex. Mesosoma: hind tibia wider than basitarsus (4: 3). Metasoma: S6 (Fig. 9A) with median and lateral lobes poorly developed, S7 (Fig. 9D–E) short narrow median lobes, short hairs on apical quarter, lateral lobes small, translucent, ventral surface of disc coriaceous; apical plate of S8 sub-circular, distal margin with median emargination (Fig. 64E); genital capsule (Fig. 9F–G) gonostylus truncate apically, short unbranched hairs on apical half.

**Sculpture.** Head: labrum shiny, impunctate except on apical margin at base of hairs; clypeus apical quarter impunctate, rest of clypeus densely punctate, surface between punctures shiny, smooth. Mesosoma: scutum and scutellum with shallow punctures, surface granulate; propodeal triangular small, granulate, rest of propodeum coriaceous.

**Vestiture.** Head: long pale brown hairs on apical margin of labrum; long white plumose hairs on lateral margin of clypeus, paraocular areas and frons. Mesosoma: pubescence short and sparse on disc of scutum, mixture of black and pale straw-coloured hairs on scutellum and metanotum; hair on legs white to pale straw-coloured. Metasoma: white apical hair bands on T2–T4, brown on T5, fimbriae on T6–T7 light brown.

### Host flower records

A sample of 212 females was collected on oil-producing flowers, the majority (60.8%) were on *Hemimeris racemosa*, 21.7 per cent on *Diascia parviflora* and the rest on *D. patens* (7.1%), *D. veronicoides* (6.6%), *Hemimeris gracilis* (2.8%) and *D. macrophylla* (0.9%).



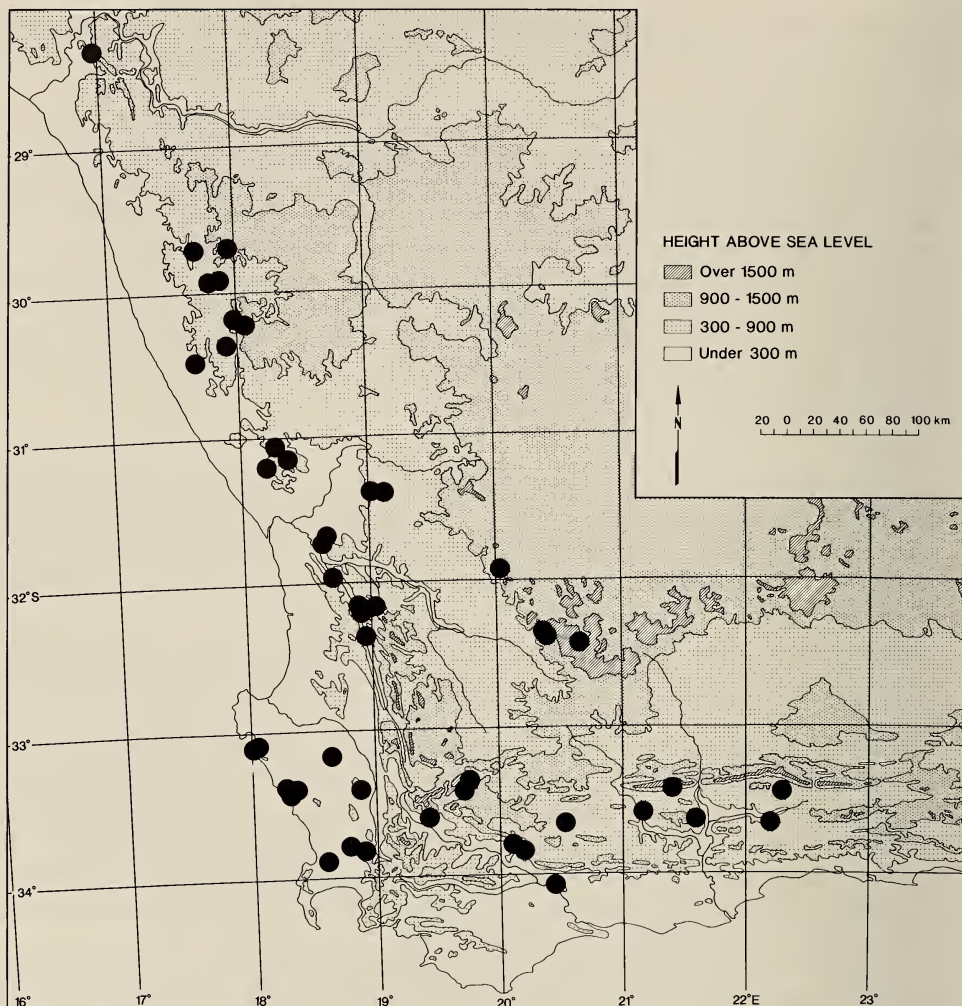


Fig. 10. Known distribution of *Rediviva bicava* sp. nov.

Only 28 females were collected on nectar plants, the majority on *Cysticapnos vesicaria* (42.9%), *Oxalis pes-caprae* (14.3%) and a prostrate yellow legume (10.7%). Single females were taken on eight other plant genera, *Lachenalia*, *Bulbine*, *Polygala*, *Senecio*, *Nemesia*, *Moraea*, *Hermannia* and *Stachys*.

Of the nine males collected, the majority were taking nectar from *Cysticapnos versicaria* and the rest on *Lotononis hirsuta*, *Oxalis pes-caprae* and a *Senecio* sp.

#### Distribution (Fig. 10)

*Rediviva bicava* is the most widely distributed of all the winter rainfall oil-bees, being collected from the Richtersveld in the north to Ladismith in the

south. This species has been found on the sandy coastal plains at sea level, the mountainous areas of the Richtersveld, the granite koppies of Namaqualand and moister gullies in the dry plains of the Little Karoo.

*Rediviva intermedia* sp. nov.

Figs 1G, 11–14, 64D

*Diagnosis*

*Female.* Medium-sized, 11–14 mm, black bodied, white to straw-coloured apical hair bands on T2–T4, black hairs on base of T5, fimbriae on T6 light brown. Basal half of labrum shiny, impunctate with shallow median groove. Foreleg three-quarters length of body, oil-collecting hairs on tarsomeres 2–5. Small scale on distal dorsal angle of hind basitarsus.

*Male.* Medium-sized, 10–12 mm, black bodied with pale straw-coloured to reddish-brown pubescence. Labrum as in female except median groove less conspicuous. Middle basitarsus sinuate in shape. Diffuse apical hair bands on T2–T4. Pubescence on T5 black, on T6 black basally, light brown apically. S6 ventrally with lateral vertical ridge fringed by short stiff hairs, S7 with median lobes covered in a mass of long hairs, lateral lobes translucent with fine spicules.

*Etymology*

From Latin *inter* and *medius*, referring to the size of this bee which is larger than *Rediviva intermixta* and smaller than *R. macgregori*, two superficially similar species that occur with it on the Nieuwoudtville Wild Flower Reserve.

*Material examined*

*Type material.* *Holotype:* SAM-HYM-B007569, female, Nieuwoudtville Wild Flower Reserve, 3119AC, V. B. Whitehead, 5 Sept. 1995. *Allotype:* SAM-HYM-B007570, male, Nieuwoudtville Wild Flower Reserve, 3119AC, V. B. Whitehead, 5 Sept. 1995. *Paratypes* (89 ♀♀, 10 ♂♂)—*Northern Cape Province:* 2 ♀♀, Calvinia, 14.2 km west on R27, 3119BC, KES, 2 Sept. 1989; 17 ♀♀, Calvinia, farm Vanrhynshoek, 3119BD, KES, 14 Oct. 1989; 8 ♀♀, Nieuwoudtville Wild Flower Reserve, 3119AC, KES, 28 Aug. 1984; 2 ♂♂, same locality, VBW, 21 July 1988; 1 ♂, same locality, VBW, 27 July 1986; 1 ♂, same locality, VBW, 7 Aug. 1986; 1 ♂, same locality, VBW, 4 Aug. 1988; 2 ♂♂, same locality, VBW, 24 Aug. 1988; 1 ♀, same locality, VBW, 27 Aug. 1994; 1 ♀, same locality, VBW, 29 Aug. 1995; 15 ♀♀, 1 ♂, same locality, VBW, 6 Sept. 1995; 4 ♀♀, same locality, VBW & MM, 26 Aug. 1984; 23 ♀♀, VBW & MM, 28 Aug. 1984; 7 ♀♀, Sutherland, 4 km south, farm Rooikloof, 3220BC, KES, 27 Sept. 1984; 1 ♀, same locality, KES, 1 Oct. 1986; 1 ♀, same locality, KES, 16 Sept. 1993; 7 ♀♀, Sutherland, same locality, VBW, 27 Sept. 1984; 1 ♀, same locality, VBW, 28 Sept. 1984; 1 ♀, same locality, VBW, 1 Oct. 1984; 1 ♀, Sutherland, 16 km west, farm Kanolfontein, 3220AD, KES, 22 Sept. 1985; 1 ♀, same locality, VBW, 27 Sept. 1984. *Western Cape Province:* 1 ♂, Botterkloof Pass, farm Piet se Hoek, 3119CD,

KES, 15 Sept. 1989; 1 ♀, De Doorns, Hex River Pass, 3319BD, KES, 3 Oct. 1989.

### *Description*

#### *Female*

*Measurements. Holotype:* body 11.2 mm, forewing 10.3 mm, malar space L : W 0.06. *Other material* (n = 20)—*Measurements and ranges:* body 12.6 mm (11.0–13.7 mm), forewing 9.8 mm (9.0–10.3 mm), foreleg 11.0 mm (10.3–11.3 mm), Ft+bt 3.6 mm (3.5–3.7 mm). *Ratios:* FL : B 0.87 (0.79–0.96), malar space L : W 0.10 (0.06–0.12).

*Integumental colour.* Head: black, mandibles black, antenna black except underside of flagellum which is light brown. Mesosoma: black, coxa, trochanter, femur and tibia black, tarsi brown. Metasoma black.

*Structure.* Mouth-parts: labrum two and a half times wider than long (54 : 21), sub-quadrangular, apical margin straight with median shallow depression (Fig. 11E); glossa (Fig. 11A) one-third length of prementum, not extending beyond labial palps, paraglossae reaching to half length of glossa; ligular arms occupying basal two-thirds of prementum; cardo as long as stipes, stipes four times as long as wide (Fig. 11D); galeal comb of 18 teeth (Fig. 11C); mandible with small rounded subapical tooth (Fig. 12F). Mesosoma: front coxa with strong inner apical spine (Fig. 12E), hind tibia (at widest point) wider than basitarsus, trapezoidal in shape, three times longer than wide (60 : 22), small scale on distal dorsal angle (Fig. 12D).

*Sculpture.* Basal half of labrum impunctate, shiny, anterior half heavily punctured at bases of stiff unbranched hairs. Scattered punctures on anterior margin of clypeus, more heavily punctured on disc, punctures approximately one diameter apart, becoming finer towards base, areas between punctures shiny. Punctuation on disc of scutum fine, widely spaced, two to three diameters apart, surface between punctures smooth, shiny. Propodeal triangle smooth, shiny, rest of propodeum shiny, finely wrinkled.

*Vestiture.* Head: long unbranched light brown hairs on apical half of labrum; clypeus and supraclypeal area with long plumose, white to pale straw-coloured hairs, some black hairs on paraocular area and vertex. Mesosoma: scutum with straw-coloured pubescence mixed with black on disc; long white plumose hairs on scutellum, metanotum, propodeum and episternal areas. Front and middle coxae with light brown plumose hairs, shorter and paler on trochanter and femur; tarsus of front leg, tibia and basitarsus of middle and hind leg with light brown vestiture. Foretarsus with dense oil-collecting hairs on tarsomeres 2–5 (Fig. 12B), middle tarsus with similar hairs on tarsomeres 2–4. Metasoma: apical hair bands on T2–T4, short black suberect hairs on basal half of T4, fimbriae on T5 black basally, light brown apically, fimbriae on T6 light brown. Long plumose light brown hairs on apical margin of S2–S6.

#### *Male*

*Measurements. Allotype:* male, body 11.7 mm, forewing 9.2 mm, malar space L : W 0.11. *Other material* (n = 9)—*Measurements and ranges:* body



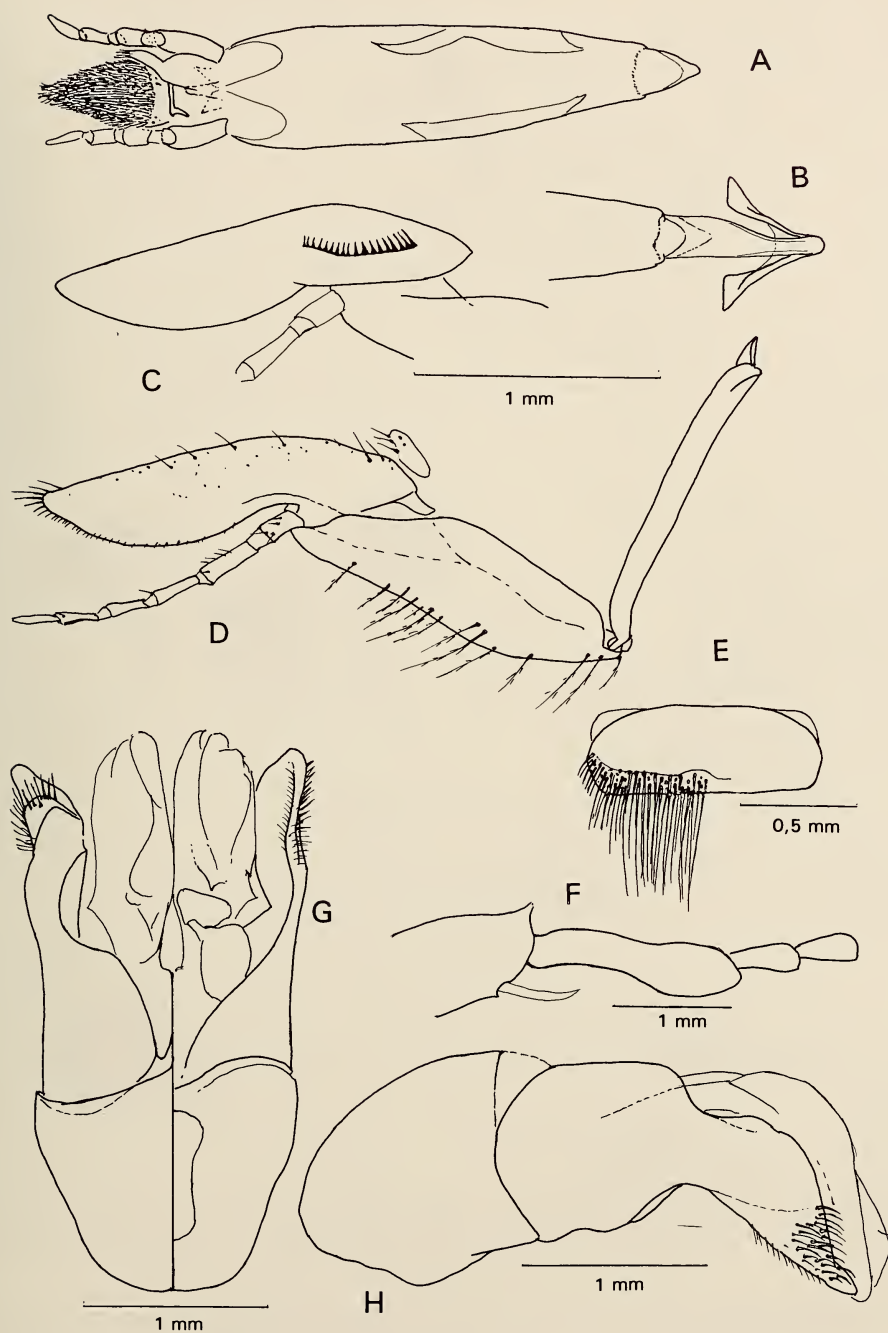


Fig. 11. *Rediviva intermedia* sp. nov. A-E. Female. A. Labium, anterior aspect. B. Base of prementum, mentum and lorum. C. Inner view of maxilla to show galeal comb. D. Left maxilla. E. Labrum. F-H. Male. F. Sinuate midbasitarsus. G. Dorsal and ventral view of genitalia. H. Lateral aspect of genital capsule.

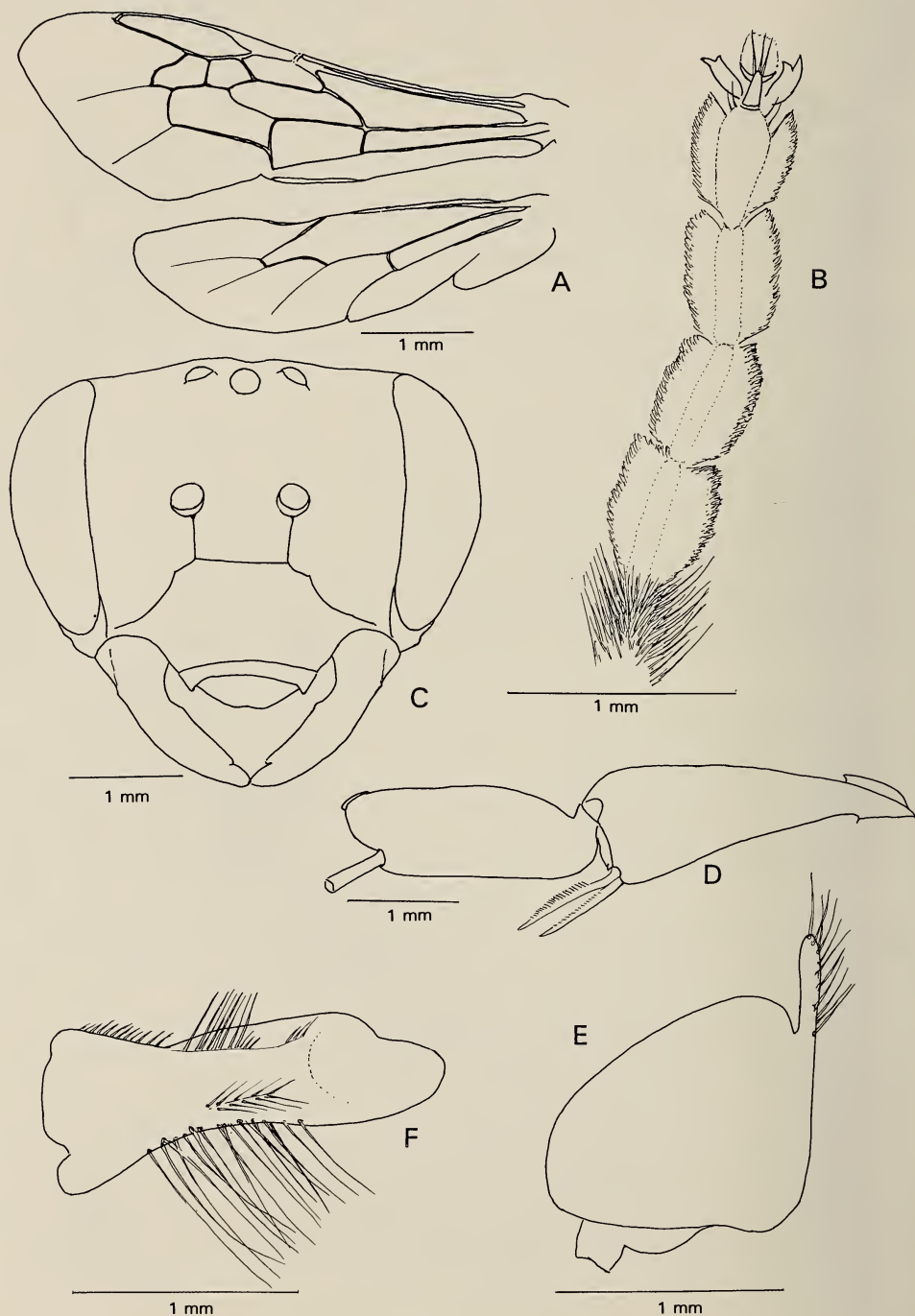


Fig. 12. *Rediviva intermedia* sp. nov. Female. A. Left wings. B. Tip of basitarsus plus tarsomeres 2-5 of foreleg. C. Anterior aspect of head. D. Tibia and basitarsus of hind leg. E. Front coxa. F. Right mandible.

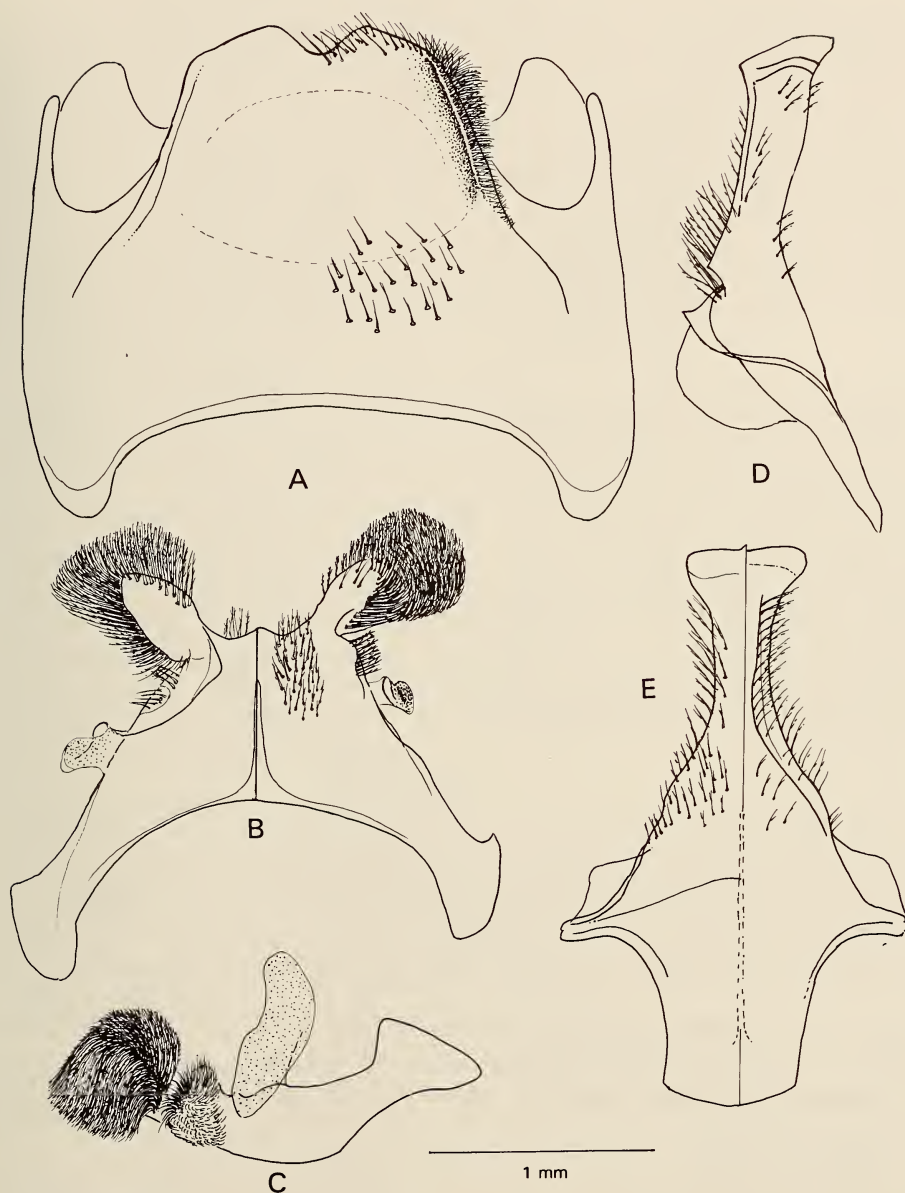


Fig. 13. *Rediviva intermedia* sp. nov. Male. A. Ventral view of S6. B. Dorsal and ventral view of S7. C. Lateral and ventral view of S8. D. Lateral aspect of S7. E. Dorsal and ventral view of S8.

11.6 mm (10.5–12.3 mm), foreleg 9.0 mm (8.8–9.2 mm), forewing 9.9 mm (9.5–10.5 mm). Ratios: FL : B 0.78 (0.72–0.85).

**Integumental colour.** Head: black, flagellum black above, brown below, brown more extensive apically. Mesosoma: legs black except front tarsus, middle and hind tibia and tarsus light brown.



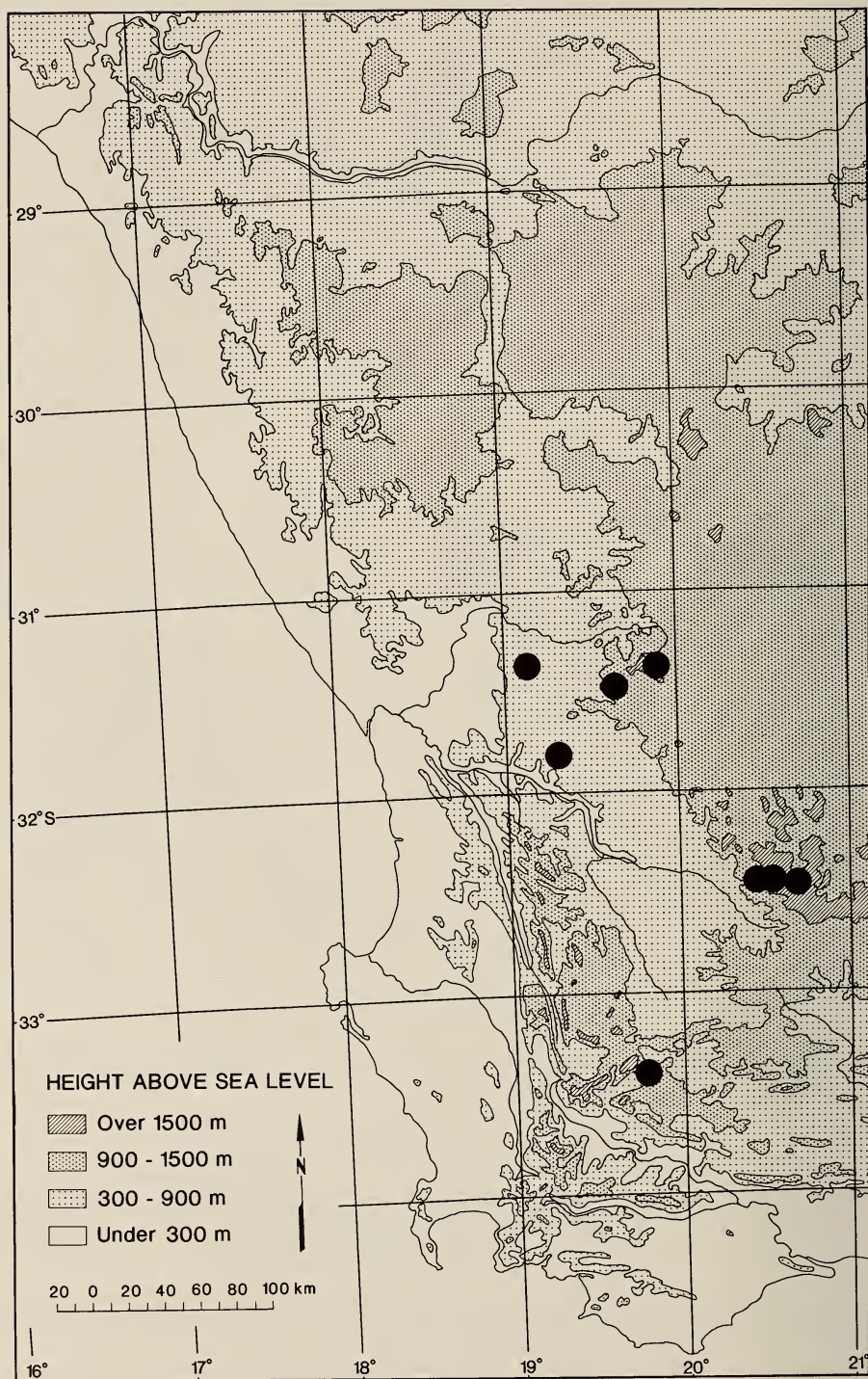


Fig. 14. Known distribution of *Rediviva intermedia* sp. nov.

*Structure.* Head: labrum as in female but median groove shallower and less discernible. Mesosoma: foreleg three-quarters length of body; middle basitarsus shallowly sinuate (Fig. 11F). Metasoma: S6 with poorly developed median lobes, lateral lobes in form of shallow vertical ridge fringed with short stiff branched hairs (Fig. 13A), S7 (Fig. 13B–C) with large circular median lobes covered in mass of long plumose vestiture both on dorsal and ventral surfaces, tuft of strong unbranched hairs at base, lateral lobes long and translucent with fine spicules. S8 (Fig. 13D–E, 64D) apical plate subcircular, slightly longer than wide, concave, distal margin entire (Fig. 64D). Penis valves slightly longer than gonostylus; apex of gonoforceps pointed with short stout spines on apical half (Fig. 11G–H).

*Sculpture.* As in female.

*Vestiture.* Head: long straw-coloured plumose hairs covering clypeus, supraclypeal, paraocular areas and frons; shorter black pubescence on vertex. Mesosoma: light brown pubescence covering scutum, shorter and sparser black hairs on disc; scutellum, metanotum and propodeum similarly clothed except absence of black hairs on propodeum; hairs on legs pale straw-coloured becoming light brown on tibia and tarsus, extremely long on dorsal surface of basitarsus of middle legs. Metasoma: T2–T4 with pubescence pale straw-coloured to reddish-brown; black on T5; fimbriae on T6 black basally light brown apically; diffuse apical hair bands on T2–T4.

There is some variation of pubescence colour of males, those collected early in the season, July to early August, are a rich reddish-brown in contrast to the pale straw-colour of bees caught later.

#### *Host flower records*

Eight species of oil-producing plants were visited by females. The greatest number was collected visiting *Diascia cardiosepala* (46.2%), followed by *Hemimeris centrodes* (18.7%), *D. macrophylla* (12.1%) and *D. 'floribunda'* (10.9%). The remaining 12.1 per cent were taken on *Alonsoa unilabiata*, *Diascia nana* and *Hemimeris racemosa*. The only nectar plant visited was *Arctotheca calendula*.

The small sample ( $n = 10$ ) of males was collected mainly taking nectar from *A. calendula* and an *Othonna* species, with a single specimen on *Heliophila*. One male was collected patrolling the oil plant *Diascia cardiosepala*.

#### *Distribution* (Fig. 14)

*Rediviva intermedia* has been found only at five sites, namely, Nieuwoudtville, Calvinia, Sutherland, the Hex River Pass near De Doorns, and the Botterkloof Pass south of Nieuwoudtville. These localities are all situated on the western rim of the Karoo escarpment.

*Rediviva albifasciata* Whitehead & Steiner, 1994

Figs 1A, 15–18, 63A

*Rediviva albifasciata* Whitehead & Steiner, 1994: 2.

### *Diagnosis*

*Female*. Small, 8–10 mm, body black to dark brown. Forelegs not attenuate, three-quarters length of body. Tarsi of fore- and middle legs with flattened scrapers on anterior and posterior surfaces; shiny scale-like projection on dorsal distal angle on hind basitarsus. Apical margins of metasomal terga 1–4 with white hairbands.

*Male*. Small, 7–9 mm, body black. Legs black except tarsus of middle leg and tibia and tarsus of hind legs light brown. White hairbands on apical margins of T1–T5, fimbriae of T6 light brown. Gonostylus of male with apical 'half flattened. Apical margin of S8 entire.

### *Etymology*

The name refers to the prominent white hair bands on the apical margin of the metasomal terga.

### *Material examined*

*Type material*. *Holotype*: SAM-HYM-B000384, female, Northern Cape Province, 23 km south of Springbok, farm Mesklip, 2917DD, K. E. Steiner, 10 Aug. 1985. *Allotype*: SAM-HYM-B000385, male, Northern Cape Province, Goegab (Hester Malan) Nature Reserve, 2917DB, M. Struck, 30 July 1986. *Paratypes* (64 ♀♀, 14 ♂♂) collected from Springbok to south of Nieuwoudtville and Clanwilliam from July to September.

### *Description*

#### *Female*

*Measurements*. *Holotype*: body 8.8 mm, forewing 7.7 mm, malar space L : W 0.29. *Other material* (n = 30)—*Measurements and ratios*: body 9.0 mm (8.2–10.3 mm), foreleg 6.9 mm (6.5–7.3 mm), forewing 7.6 mm (7.2–8.0 mm). *Ratios*: FL : B 0.77 (0.66–0.83), malar space L : W 0.28 (0.24–0.32).

*Integumental colour*. Body black to dark brown, tegula, tibiae, tarsi and flagellum on underside, light brown.

*Structure*. Mouth-parts (Fig. 15A–G): glossa one-third length of prementum, labial palp extending beyond tip of glossa, paraglossa reaching a little beyond half length of glossa; apex of galea rounded, galeal comb with 20 teeth; labrum sub-triangular, wider than long (7 : 4). Mesosoma: median mesoscutal line extending three-quarters length of segment, lying in slight depression; front legs not attenuate, three-quarters length of body; hind tibia as wide as basitarsus; hind basitarsus length 2.4 times width, with small scale-like projection on distal dorsal angle, distal margin oblique (Fig. 16D).

*Sculpture*. Head: clypeus coarsely punctate, punctures sparser apically, area between punctures shiny; supraclypeal area coarsely punctate, surface between punctures roughened. Mesosoma: scutum finely and densely punctate, punctures less dense in median longitudinal depression where surface between punctures more shiny.

*Vestiture*. Pubescence on underside of head, mesonotum and metanotum as well as coxa, trochanter and femur pale straw-coloured; hairs on tibia and tarsus



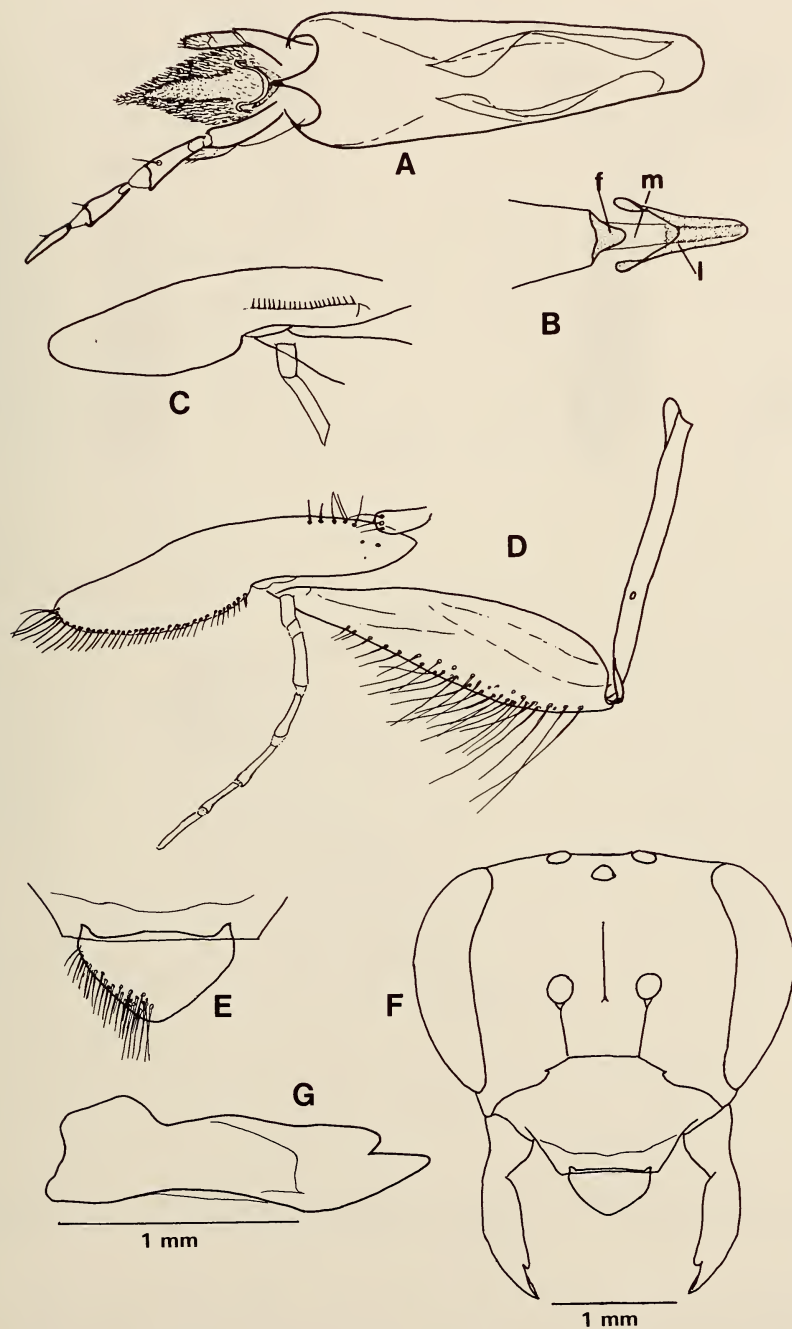


Fig. 15. *Rediviva albifasciata* Whitehead & Steiner, 1994. Female. A. Labium, posterior view. B. Base of prementum with mentum and lorum, posterior aspect. C. Inner view of galea to show galeal comb. D. Left maxilla. E. Labrum. F. Anterior aspect of head. G. Right mandible.

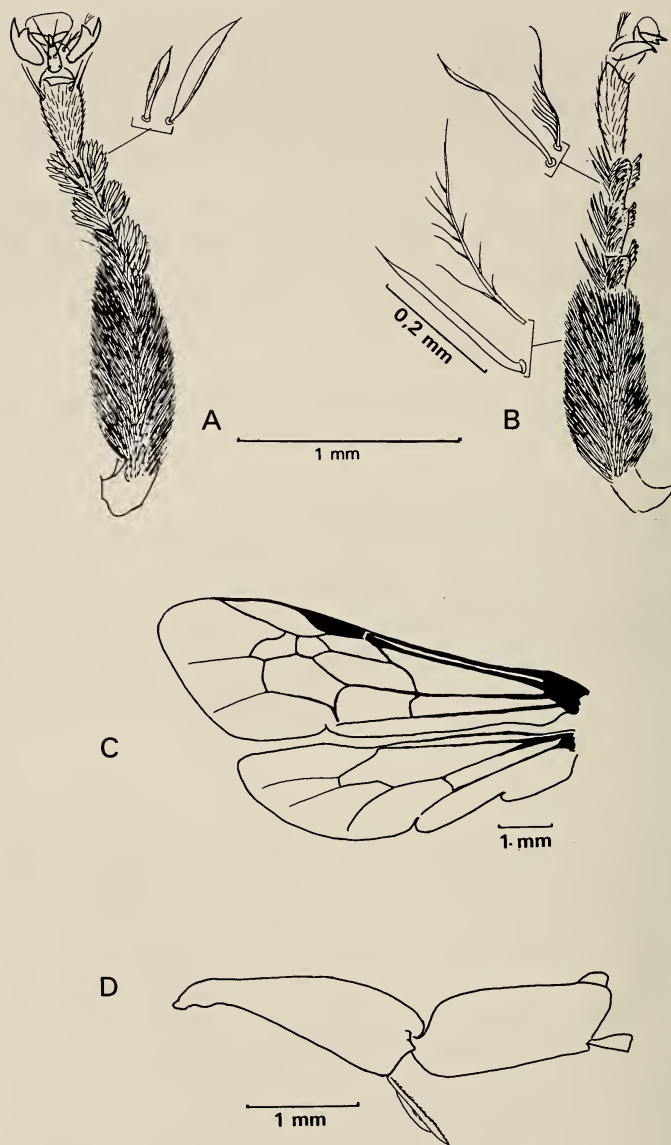


Fig. 16. *Rediviva albifasciata* Whitehead & Steiner, 1994. Female. A. Foreleg, dorsal view. B. Foreleg, lateral view. C. Left fore- and hind wings. D. Hind tibia and basitarsus.

of all legs, scutum, scutellum and metanotum, light brown with some black hairs; prominent white apical hair bands on T1-T4; short decumbent black hairs on basal two-thirds of T2-T5, fimbriae of T5 brown dorsally, white laterally; front and middle legs with finely branched oil-collecting hairs on basitarsus and oil-collecting hairs and curved flattened scrapers on anterior and posterior surfaces of tarsomeres 2-4 (Fig. 16A-B).

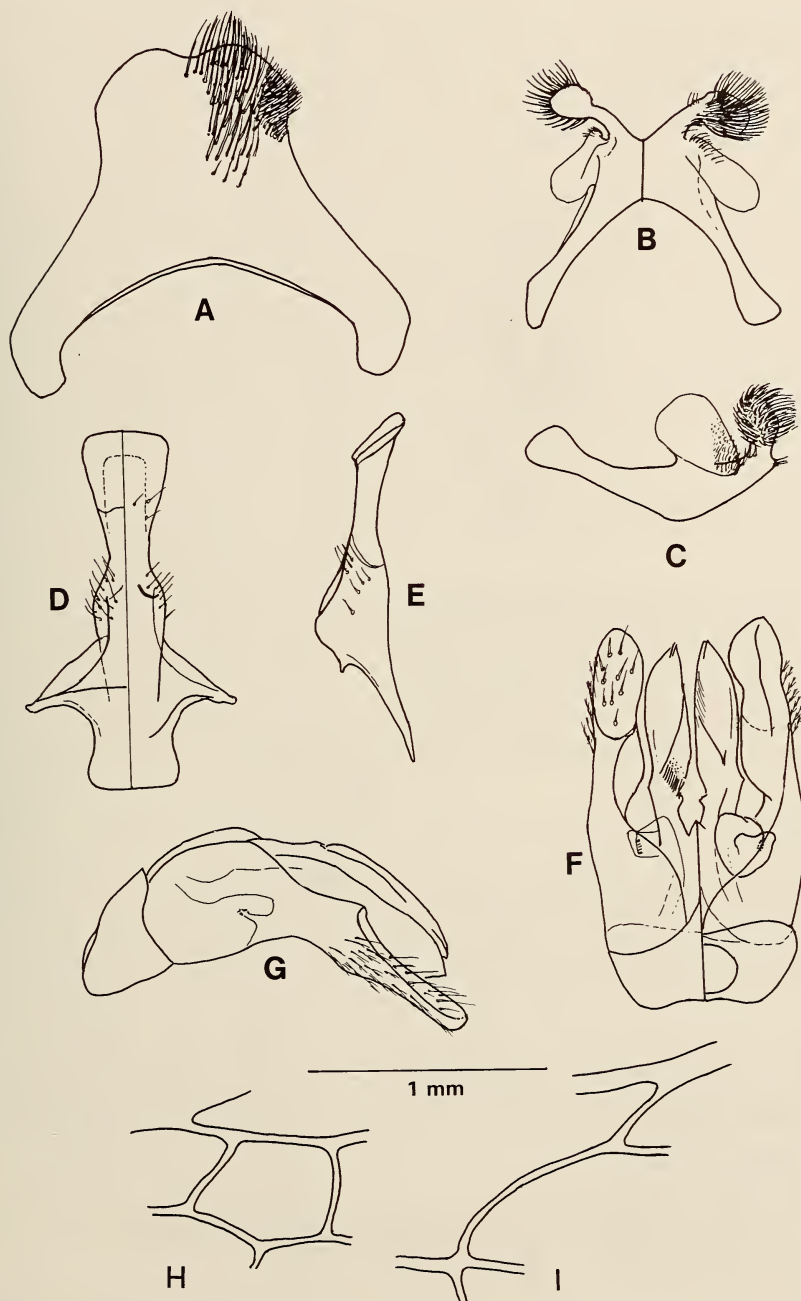


Fig. 17. *Rediviva albifasciata* Whitehead & Steiner, 1994. A-G. Male. A. S6, ventral view. B. S7, dorsal and ventral view. C. S7, lateral aspect. D. S8, dorsal and ventral view. E. S8, lateral view. F. Dorsal and ventral aspect of genitalia. G. Genital capsule, lateral view. H-I. Female. H. Second submarginal cell of right forewing. I. Basal vein plus first abscissa of Rs of right forewing.



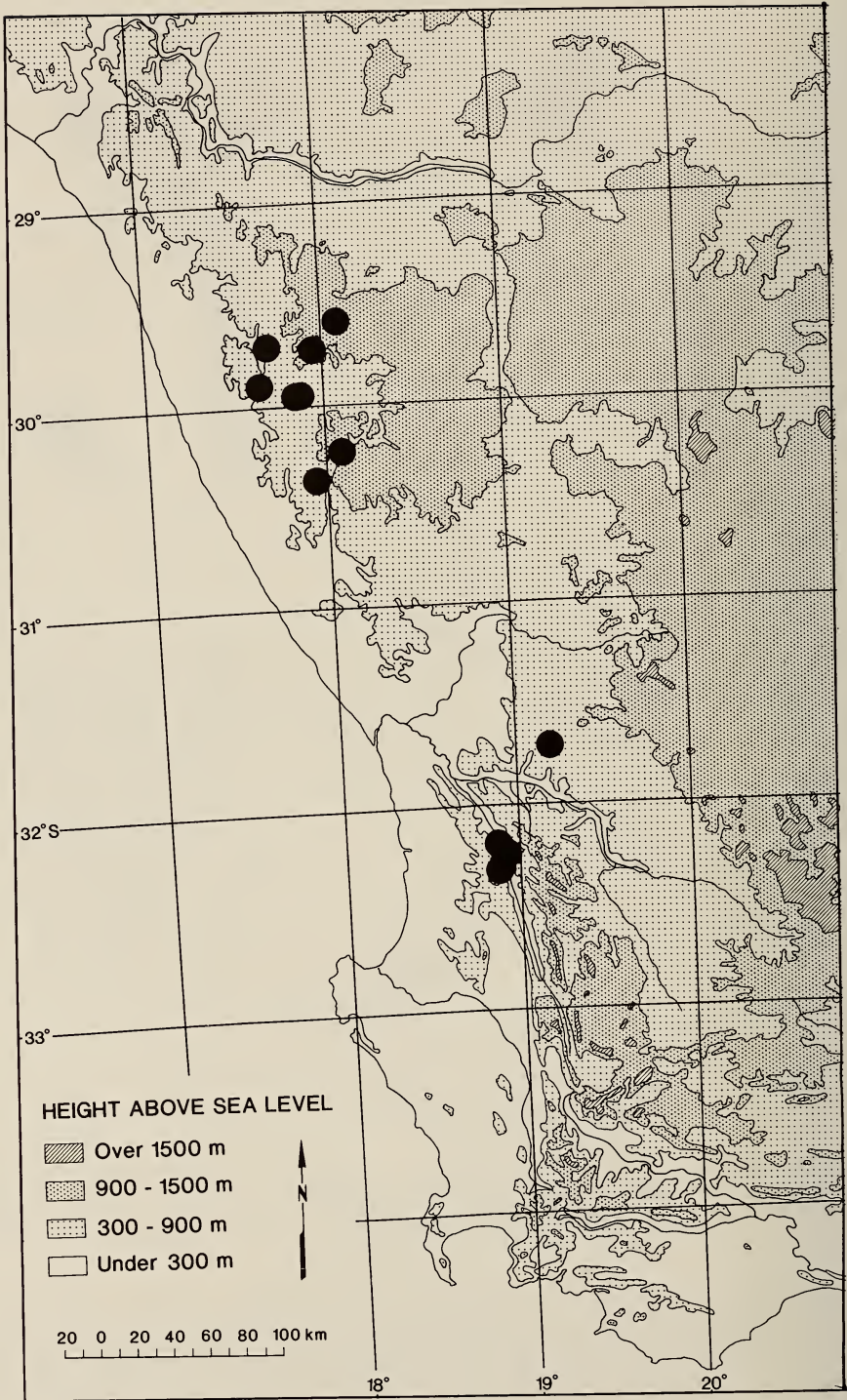


Fig. 18. Known distribution of *Rediviva albifasciata*.

*Male*

*Measurements.* Allotype: body 7.8 mm, forewing 6.8 mm. *Other material* ( $n = 6$ )—*Measurements and ranges*: body 8.2 mm (6.9–8.5 mm), foreleg 6.3 mm (5.9–6.6 mm), Ft+bt 2.4 mm (2.3–2.4 mm), forewing 7.1 (6.9–7.4 mm). *Ratios*: FL : B 0.77 (0.67–0.90), malar space L : W 0.38 (0.32–0.42).

*Integumental colour.* Body black, ventral surface of antennae, tarsi of front and middle legs light brown, tibiae and tarsi of hind legs darker brown.

*Structure.* Foreleg three-quarters length of body, mean FL : B as in female, hind tibia slightly wider than basitarsus; S6 (Fig. 17A) with median and lateral lobes poorly developed, translucent area on disc; S7 (Fig. 17B–C) with deeply emarginate apical margin, conspicuous median lobes, large oval translucent lateral lobes, papillate on basal third; S8 (Fig. 17D–E, 63A) with apical margin entire. Genitalia (Fig. 17F–G): gonostylus extending a little beyond apex of penis valve, apical half dorsally flattened.

*Sculpture.* Clypeus, paraocular and supraclypeal areas coarsely punctured, surface between punctures shiny; scutum finely punctate, more coarsely punctured on scutellum and metanotum.

*Vestiture.* Head: light brown unbranched hair on labrum, rest of head covered in long silky white pubescence, black hairs along inner margin of eye, epistomal suture and vertex. Mesosoma: covered in pale brown plumose hairs, some black hairs on disc of scutellum. Metasoma: white apical hair bands on T1–T6, S6 having branched pale straw-coloured hairs and tuft of short black hairs on lateral lobe, S7 with strong recurved branched hairs on outer surface of median lobe.

*Host flower records*

Females collect oil from *Colpias mollis* and *Hemimeris racemosa* and nectar from *Oxalis pes-caprae*, *Oxalis* sp. and *Cysticapnos versicaria*. Males take nectar from *Othonna arbuscula*, *Oxalis pes-caprae* and *O. comosa*. Males also patrol the two oil-producing plants presumably in search of receptive females.

*Distribution* (Fig. 18)

*Rediviva albifasciata* occurs mainly in the mountainous region of northern Namaqualand, but also has disjunct populations 300 km south in the Nieuwoudtville and Clanwilliam areas.

*Rediviva intermixta* (Cockerell, 1934)

Figs 1F, 19–22, 64F

*Notomelitta intermixta* Cockerell, 1934: 450.

*Rediviva intermixta* (Cockerell) Michener, 1981: 47.

*Diagnosis*

*Female.* Medium-sized, black-bodied bees, 10–12 mm long. Front legs four-fifths length of body, hind basitarsus light brown with large shiny brown scale

on distal dorsal angle. Finely divided oil-collecting hairs on tarsomeres 2–4 of front and middle legs. Light straw-coloured apical hair bands on T2–T4, pubescence on T5–T6 light brown.

*Male.* Length 9–10 mm, integument black, covered in long white to straw-coloured pubescence. Apical hair bands less distinct than in females but visible on T2–T5, pubescence on T6 light brown, black erect hairs at bases of T4–T5. Hind tibia and basitarsus light brown. S5 having latero-apical tubercles with stout apical hairs, S6 with narrow, shallowly emarginate apex, distinctive median and lateral lobes on S7.

### *Material examined*

*Type material.* *Holotype:* B. M. Type Hym. 17a 1831, male, Worcester. Cape Province. R. E. Turner, 17–31 Aug. 1928. Natural History Museum, London.

*Other material* (657 ♀♀, 221 ♂♂)—*Northern Cape Province:* 4 ♀♀, Botterkloof Pass, 3119CD, KES, 15 Sept. 1989; 1 ♀, Bowesdorp, 3012BB, VBW, 28 Aug. 1980; 1 ♂, Calvinia, farm Toren, 3119BC, KES, 26 Aug. 1985; 1 ♀, 4 ♂♂, same locality, VBW & MM, 25 Aug. 1985; 4 ♀♀, 8 ♂♂, same locality, VBW & MM, 26 Aug. 1985; 2 ♂♂, Garagams, 3017BD, VBW, 28 July 1985; 2 ♂♂, Kamieskroon, farm Bakleikraal, 3018AA, KES, 19 Aug. 1988; 1 ♀, Kamieskroon, farm Dassiefontein, 3017DB, MM, 4 Sept. 1986; 3 ♂♂, same locality, VBW, 4 Sept. 1986; 2 ♂♂, same locality, VBW, 7 Sept. 1986; 1 ♂, VBW, 8 Sept. 1986; 2 ♀♀, Karkams, 3017BD, KES, 10 Aug. 1985; 8 ♀♀, same locality, KES, 23 Aug. 1985; 1 ♂, same locality, KES, 4 Sept. 1986; 3 ♀♀, same locality, KES, 6 Sept. 1986; 3 ♀♀, 13 ♂♂, same locality, KES, 18 Aug. 1988; 1 ♂, same locality, KES, 19 Aug. 1988; 1 ♂, same locality, VBW, 8 Aug. 1985; 2 ♂♂, same locality, VBW, 10 Aug. 1985; 13 ♀♀, 10 ♂♂, same locality, VBW, 28 Aug. 1985; 4 ♀♀, 3 ♂♂, same locality, VBW, 18 Aug. 1988; 2 ♀♀, Middelpoos, farm Blomfontein, 3219BB, KES, 23 Sept. 1985; 3 ♀♀, 16 ♂♂, same locality, KES, 3 Oct. 1985; 8 ♀♀, Middelpoos, farm Blomfontein, 3220CC, KES, 1 Oct. 1992; 10 ♀♀, Middelpoos, farm Blomfontein, 3219BB, VBW, 28 Aug. 1984; 2 ♀♀, same locality, VBW, 24 Sept. 1985; 29 ♀♀, same locality, VBW, 3 Oct. 1985; 11 ♂♂, Middelpoos, farm Hartbeestfontein, 3120CC, KES, 27 Aug. 1990; 2 ♀♀, 5 ♂♂, same locality, VBW, 2 Oct. 1986; 3 ♀♀, 7 ♂♂, same locality, VBW, 27 Aug. 1990; 2 ♀♀, same locality, VBW, 16 Sept. 1993; 6 ♀♀, Nieuwoudtville, 3119AC, KES, 26 Aug. 1984; 1 ♀, same locality, VBW, 20 Aug. 1990; 3 ♀♀, Nieuwoudtville, 5 km south, 3119AC, KES, 24 Sept. 1986; 1 ♀, same locality, KES, 2 Sept. 1989; 1 ♀, same locality, KES, 25 Sept. 1989; 1 ♀, same locality, KES, 28 Sept. 1989; 2 ♀♀, 1 ♂, same locality, VBW & MM, 31 Aug. 1985; 3 ♀♀, same locality, VBW, 11 Sept. 1987; 2 ♀♀, same locality, VBW, 25 Aug. 1988; 1 ♂, Nieuwoudtville, Botterkloof road, 3119CD, VBW, 6 Sept. 1994; 68 ♀♀, Nieuwoudtville Wild Flower Reserve, 3119AC, KES, 28 Aug. 1984; 1 ♀, same locality, KES, 11 Sept. 1984; 26 ♀♀, same locality, KES, 27 Aug. 1985; 6 ♂♂, same locality, KES, 8 Aug. 1986; 4 ♂♂, same locality, KES, 28 Aug. 1986; 16 ♀♀, same locality, KES, 6 Sept. 1986; 32 ♀♀, same locality, KES, 9 Sept. 1986; 3 ♀♀, same locality, KES, 25 Sept. 1986; 1 ♂, same



locality, 3119AC, KES, 29 Sept. 1986; 14 ♀♀, same locality, MM, 9 Sept. 1986; 3 ♂♂, same locality, MM, 31 Aug. 1987; 19 ♀♀, 9 ♂♂, same locality, VBW & MM, 26 Aug. 1984; 3 ♀♀, 5 ♂♂, same locality, VBW & MM, 27 Aug. 1984; 49 ♀♀, 9 ♂♂, same locality, VBW & MM, 28 Aug. 1984; 7 ♀♀, 10 ♂♂, same locality, VBW & MM, 29 Aug. 1984; 2 ♀♀, 2 ♂♂, same locality, VBW & MM, 10 Sept. 1984; 23 ♀♀, 2 ♂♂, same locality, VBW & MM, 11 Sept. 1984; 6 ♀♀, same locality, VBW & MM, 23 Aug. 1985; 31 ♀♀, same locality, VBW & MM, 27 Aug. 1985; 3 ♂♂, same locality, VBW, & MM, 28 Aug. 1985; 1 ♀, 19 ♂♂, same locality, VBW, 2 Aug. 1984; 4 ♀♀, same locality, VBW, 8 Aug. 1986; 9 ♀♀, 1 ♂, same locality, VBW, 14 Aug. 1986; 2 ♀♀, 1 ♂, same locality, VBW, 25 Aug. 1986; 5 ♂♂, same locality, VBW, 4 Aug. 1988; 3 ♀♀, same locality, VBW, 27 Aug. 1994; 3 ♀♀, same locality, VBW, 29 Aug. 1994; 1 ♀, same locality, VBW, 6 Sept. 1994; 3 ♀♀, Nieuwoudtville, farm Glenlyon, 3119AC, 24 Aug. 1990; 6 ♀♀, same locality, VBW & MM, 29 Aug. 1985; 23 ♀♀, same locality, VBW, 10 Sept. 1986; 1 ♀, same locality, VBW, 11 Sept. 1987; 6 ♀♀, Nieuwoudtville, Grasberg road, 3219AC, KES, 10 Sept. 1986; 2 ♂♂, Nieuwoudtville, farm Lokenberg, 3119CA, VBW, 26 Sept. 1986; 3 ♀♀, Nieuwoudtville, Oorlogskloof road, 3119AC, VBW, 24 Sept. 1986; 1 ♀, 1 ♂, same locality, VBW, 28 Aug. 1994; 1 ♀, 5 ♂♂, Nieuwoudtville, farm Willemsrivier, 3119AA, VBW, 28 Aug. 1994; 5 ♀♀, Sutherland, 4 km south, 3220BC, KES, 27 Sept. 1984; 6 ♀♀, Sutherland, farm Tweeriviere, 3220AD, KES, 1 Oct. 1986; 1 ♀, same locality, KES, 29 Aug. 1994; 3 ♀♀, same locality, VBW, 1 Sept. 1986. *Western Cape Province*: 2 ♀♀, Clanwilliam, Bidouw Valley, 3219AA, VBW, 30 Aug. 1990; 2 ♀♀, 2 ♂♂, Clanwilliam, 0.6 km south, 3218BB, VBW, 5 Aug. 1989; 2 ♀♀, 8 ♂♂, same locality, VBW, 11 Aug. 1989; 2 ♀♀, Clanwilliam 17.5 km south, 3218BD, KES, 24 Aug. 1984; 3 ♀♀, same locality, KES, 29 July 1984; 7 ♀♀, 1 ♂, same locality, VBW, 24 Aug. 1983; 8 ♀♀, same locality, VBW, 8 Aug. 1984; 2 ♀♀, same locality, VBW, 24 Aug. 1984; 1 ♀, same locality, VBW, 11 Sept. 1991; 3 ♀♀, Clanwilliam, 7 km south, 3218BB, VBW & MM, 30 Aug. 1985; 2 ♀♀, same locality, MM, 3 Sept. 1986; 4 ♀♀, same locality, 3 Sept. 1986; 2 ♀♀, 9 ♂♂, Clanwilliam, farm Koeglmanskloof, 3218BB, KES, 6 Aug. 1989; 1 ♀, Clanwilliam, Ramskop Camp, 3218BB, KES, 22 Aug. 1984; 1 ♀, same locality, MM, 23 Aug. 1984; 3 ♀♀, same locality, VBW, 24 Aug. 1984; 4 ♀♀, De Doorns, farm Appaskop, 3319BC, KES, 18 Sept. 1992; 1 ♀, same locality, KES, 29 Sept. 1992; 5 ♀♀, same locality, VBW, 24 Sept. 1992; 2 ♀♀, Elandsbaai, farm Skerpheuwel, 3218AD, VBW, 27 Aug. 1987; 8 ♀♀, 12 ♂♂, Gouda, Voëlvllei Dam, 3319AC, KES, 7 Sept. 1988; 3 ♀♀, 8 ♂♂, same locality, VBW, 6 Sept. 1988; 7 ♀♀, same locality, VBW, 8 Sept. 1988; 2 ♂♂, Het Kruis, 3218DB, KES, 22 Aug. 1991; 1 ♂, Het Kruis, farm Groenrivier, 3218DB, VBW, 22 Aug. 1988; 1 ♀, Klawer, 4 km north on N7, 3118DA, VBW, 5 Aug. 1989; 3 ♀♀, Klawer, farm Zyperfontein, 3118DC, 22 Aug. 1989; 1 ♀, Malmesbury, road to old dump site, 3318BC, KES, 16 Sept. 1987; 2 ♀♀, same locality, KES, 14 Sept. 1994; 11 ♀♀, same locality, VBW, 14 Sept. 1994; 1 ♀, same locality, VBW, 20 Sept. 1994; 1 ♀, same locality, VBW, 14 Sept. 1995; 1 ♀, same locality, VBW, 24 Sept. 1995; 1 ♀, Moorreesburg, farm Neulfontein, 3318BA, VBW, 23 Aug. 1988; 4 ♀♀, same locality, VBW, 7 Sept. 1988; 1 ♀, Nuwerus, Meerhofkasteel road, 3018AD, VBW, 31 Aug. 1991; 1 ♀, Parow,

Tygerberg Hills, 3318DC, VBW, 1 Oct. 1990; 1 ♀, Piketberg, farm Spitskop, 3318BB, VBW, 22 Sept. 1995; 2 ♀♀, Piketberg, farm Dezehoek, 3218AC, 5 Sept. 1987; 1 ♀, Piketberg, farm Rondegat, 3219DB, KES, 16 Sept. 1989; 4 ♂♂, Porterville, Halfmanskloof, 3318BB, VBW, 23 Aug. 1988; 4 ♀♀, Riebeek-Kasteel, Bothmaskloof Pass, 3318BD, KES, 17 Sept. 1987; 2 ♀♀, same locality, VBW, 25 Sept. 1987; 1 ♀, Sandberg Station, farm Droogerivier, 3218BC, KES, 8 Aug. 1987; 3 ♀♀, Stellenbosch, farm Joostenbergkloof, 3318DD, KES, 16 Sept. 1987; 4 ♀♀, same locality, VBW, 16 Sept. 1987; 5 ♀♀, same locality, VBW, 25 Sept. 1987; 2 ♀♀, 3 ♂♂, same locality, VBW, 4 Aug. 1988; 9 ♀♀, Worcester, Karoo Gardens, 3119CB, KES, 18 Aug. 1989; 2 ♀♀, Wupperthal, 3219AA, VBW, 29 Aug. 1990.

### *Description*

#### *Female*

*Measurements and ranges* ( $n = 15$ ). Body 10.7 mm (10.0–12.2 mm), foreleg 9.4 mm (9.1–9.8 mm), Ft+bt 3.2 mm (3.1–3.5 mm), forewing 8.9 mm (8.2–9.3 mm). *Ratios*: FL : B 0.88 (0.77–0.94), malar space ( $n = 10$ ) L : W 0.30 (0.28–0.33).

*Integumental colour*. Head: scape, funicle and first flagellar segment black, rest of flagellum black to dark brown, light brown underneath. Mesosoma: black, tegulae dark brown; coxa, trochanter and femur of legs black, tibia of front and middle legs dark brown to black, tibia of hind legs light brown, tarsi of all legs dark brown. Metasoma: dark brown to black.

*Structure*. Mouth-parts (Fig. 19A–G): glossa one-third length of prementum, labial palp not extended beyond tip of glossa, paraglossa short reaching basal third of glossa (Fig. 19A–B); cardo slightly shorter than length of stipes, apex of galea narrowly rounded (Fig. 19E), galeal comb of 16 teeth (Fig. 19D); mandible with small rounded subapical tooth (Fig. 19F); labrum with apical margin evenly convex, two and a half times as wide as long (Fig. 19G). Mesosoma: mesoscutal line depressed reaching middle of scutum; front legs not attenuate, four-fifths length of body, foretibia curved, hind tibia (at its greatest width) as wide as basitarsus, basitarsus width three-fifths its length, distal margin truncate, not extending beyond insertion of tarsomere 2, large scale on distal dorsal angle, length of scale three-quarters width of basitarsus (Fig. 20B); wing venation (Fig. 20A).

*Sculpture*. Head: labrum impunctate basally, coarsely punctured apically; clypeus and supraclypeal area coarsely punctured on disc, becoming finer laterally, surface between punctures roughened. Mesosoma: fine dense punctation on disc of scutum, area between punctures smooth, shiny; propodeal triangle small ill defined, finely strigate, rest of propodeum shiny with scattered wrinkles.

*Vestiture*. Head: labrum with stiff, unbranched light brown hairs at middle of apical margin, shorter branched hairs laterally; long black and pale straw-coloured hairs intermixed on paraocular areas; black hairs on vertex. Mesosoma: scutum, scutellum and metanotum with mixture of black and pale straw-coloured hairs, propodeum with pale straw-coloured hairs only; tibia and tarsus of all legs with light brown pubescence, dense oil-collecting hairs on

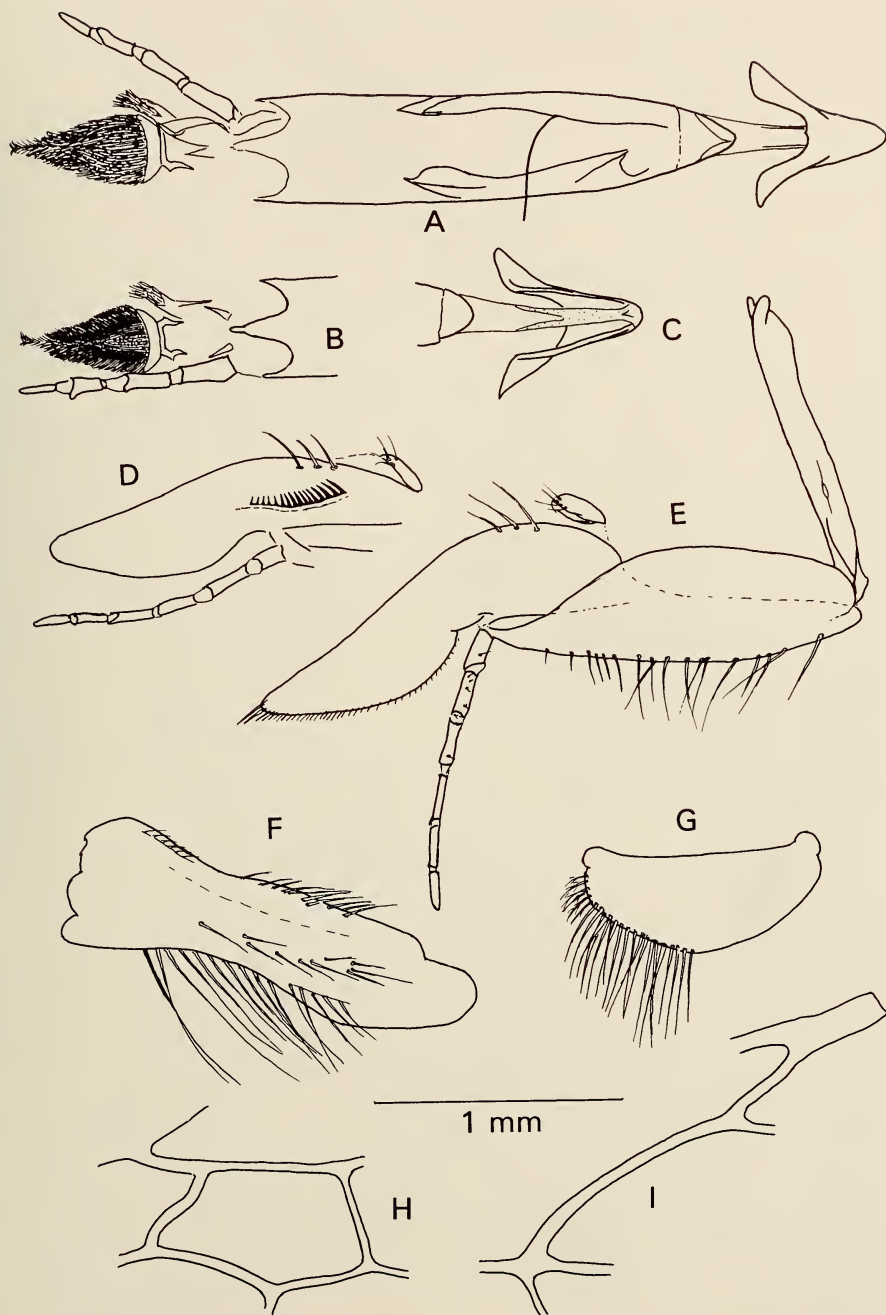


Fig. 19. *Rediviva intermixta* (Cockerell, 1934). Female. A. Labium, anterior view. B. Distal part of labium, ventral aspect. C. Base of prementum with mentum and lorum, posterior view. D. Inner view of right maxilla to show galeal comb. E. Left maxilla, outer view. F. Left mandible. G. Labrum. H. Second submarginal cell of right forewing. I. Basal vein and first abscissa of Rs of front right wing.



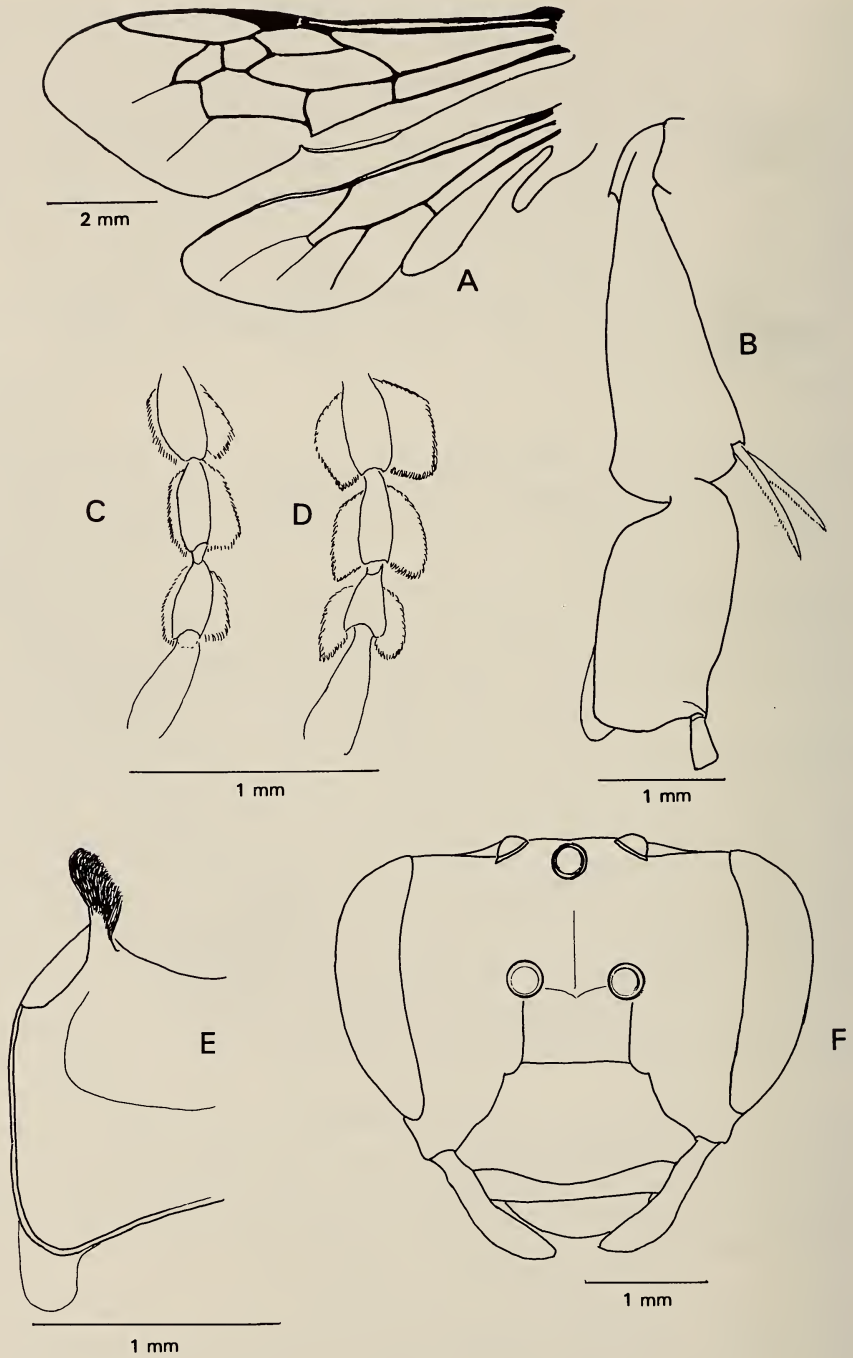


Fig. 20. *Rediviva intermixta* (Cockerell, 1934). A-D, F. Female. A. Wings. B. Hind tibia and basitarsus. C. Tarsomeres 2-4 of front leg. D. Tarsomeres 2-4 of middle leg. E. Male. Projection on anteriolateral area of S5. F. Head, anterior aspect.

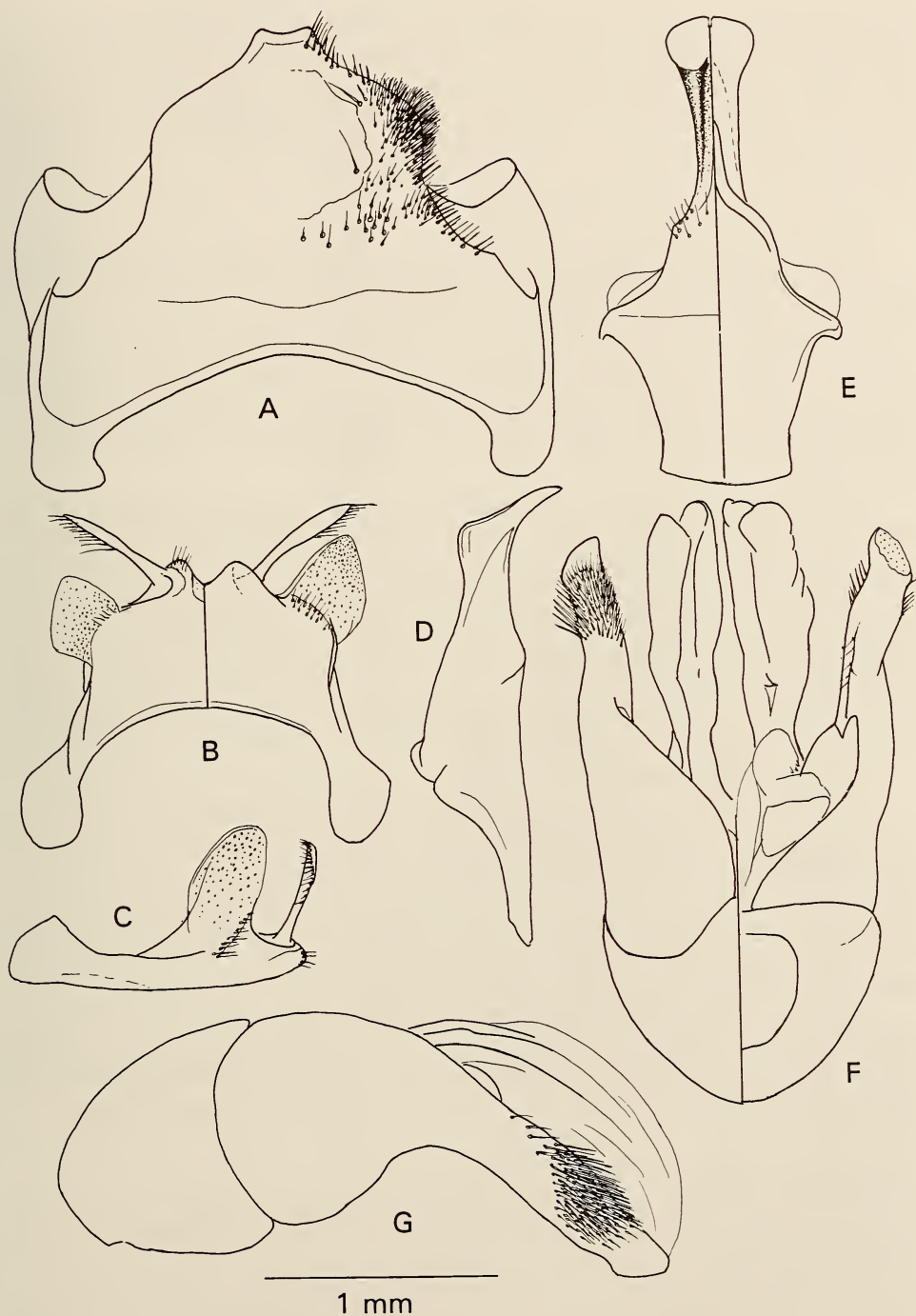


Fig. 21. *Rediviva intermixta* (Cockerell, 1934). Male. A. S6, ventral view. B. Dorsal and ventral view of S7. C. Lateral aspect of S7. D. Lateral aspect of S8. E. Dorsal and ventral view of S8. F. Dorsal and ventral view of genitalia. G. Lateral view of genital capsule.

distal quarter of basitarsus and tarsomeres 2, 3 and 4 of foreleg (Fig. 20C) and tarsomeres 2, 3 and 4 of middle leg (Fig. 20D). Metasoma: T1-T4 with long pale straw-coloured pubescence, forming hair bands on apical two-thirds of T2-T4, basal third of T3-T4 with short erect hairs sometimes intermixed with short black hairs on T4, T5 with light brown vestiture, fimbriae on T6 slightly darker brown.

#### Male

*Measurements and ranges* (n = 10): body 9.5 mm (8.5-10.8 mm), forewing 8.5 mm (7.8-10.0 mm), foreleg 7.9 mm (7.2-8.6 mm). *Ratios*: FL : B 0.84 (7.4-9.2), malar space L : W 0.33 (0.27-0.40).

*Integumental colour*. Head and antennae black. Mesosoma: scutum, scutellum, metanotum and propodeum black, tegulae dark brown, legs black except tarsus of middle legs and tibia and basitarsus of hind legs which are reddish brown. Metasoma black with narrow apical margin of terga and sterna dark brown.

*Structure*. Mesosoma: foreleg approximately three-quarters length of body, hind tibia one and a half times width of basitarsus. Metasoma: distal lateral angle of S5 with raised projection bearing tuft of stout unbranched hairs (Fig. 20E), S6 with median and lateral lobes poorly developed, median lobes forming narrow emarginate projection (Fig. 21A), S7 having narrow lanceolate median lobes with strong stout hairs on outer apical margin, lateral lobes broad, translucent, not strigate (Fig. 21B-C), S8 apical plate ovate, median emargination apically (Fig. 21D-E, 64F); gonoforceps slightly shorter than penis valves, strong unbranched hairs on apical half not reaching apex (Fig. 21F-G).

*Sculpture*. As in female.

*Vestiture*. Head: long white silky hairs on clypeus, supraclypeal and paraclypeal areas, strong black branched hairs on inner ocular margin. Mesosoma: scutum, scutellum, metanotum and propodeum with long straw-coloured hairs, scattered black hairs laterally on propodeum. Sternum, episternum, coxae, trochanters and femora with long white pubescence. Metasoma: T1-T5 with erect straw-coloured hairs, diffuse apical hair bands on T4-T5, some erect black hairs basally on latter terga, fimbriae on T6 light brown.

Cockerell (1934) described this species from a male collected by Turner in 1928 at Worcester; this is on the eastern edge of its distribution. For description of the female and re-description of the male we have used material from the Wild Flower Reserve at Nieuwoudtville which is more central in its range.

#### Host flower records

We have recorded females of this species collecting oil from 14 different oil-producing plants, two species of *Hemimeris*, 11 species of *Diascia* and one species of *Alonsoa*. The bulk of our material was collected on *Hemimeris racemosa* (55.1%) and *H. centrodes* (21.1%), with most of the remainder on *Diascia cardiosepala* (9.1%), *D. veronicoides* (6.4%) and *D. macrophylla* (2.6%). A small number (4.9%) were collected on *Alonsoa unilabiata*, *Diascia 'arenicola'*, *D. 'bicornuta'*, *D. 'whiteheadii'*, *D. 'floribunda'*, *D. lewisiae*, *D. longicornis*, *D. parviflora* and *D. tanyceras*.



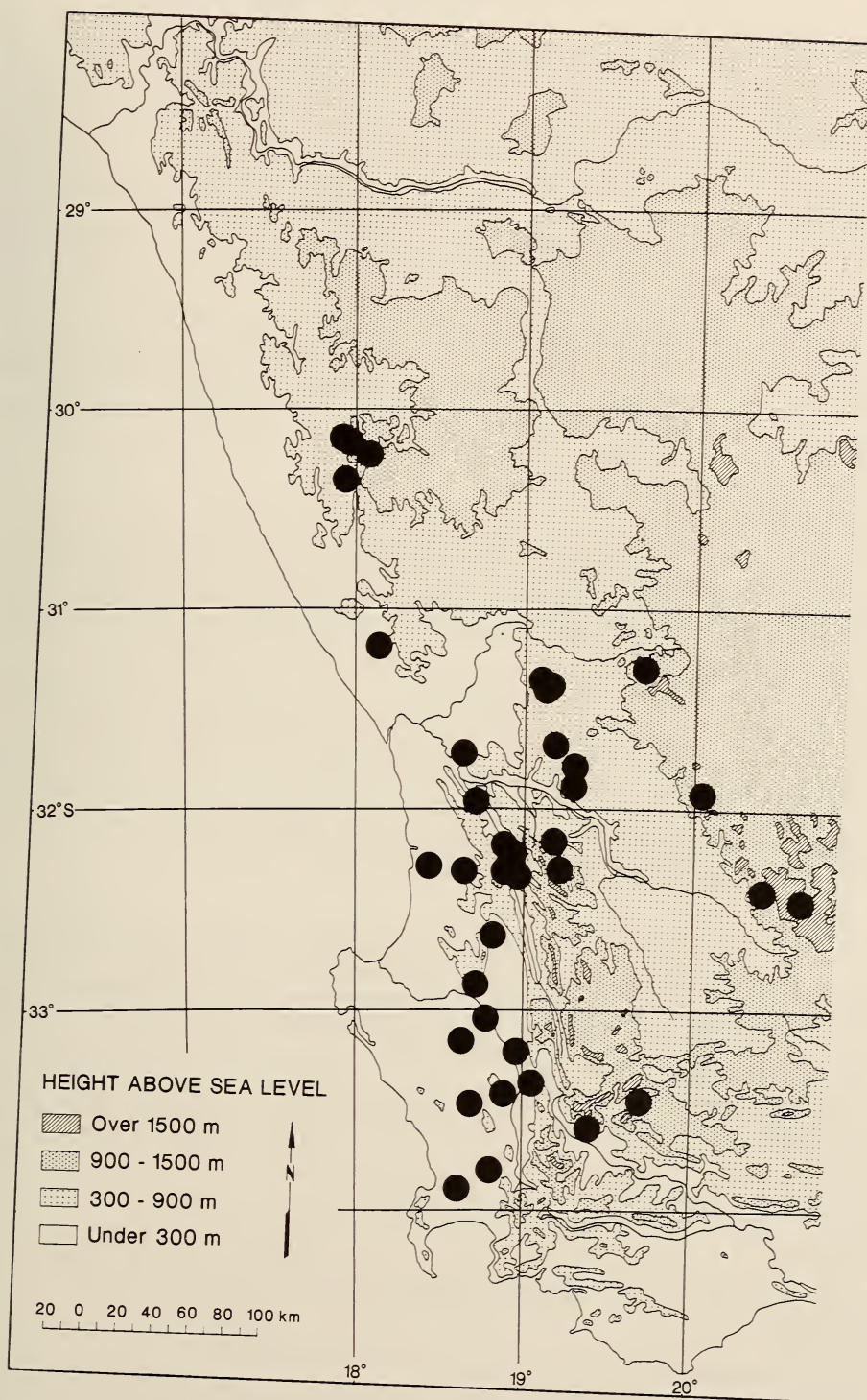


Fig. 22. Known distribution of *Rediviva intermixta*.

Nectar plants are visited by both males and females, the former not only for energy requirements but also to seek receptive females. The most commonly visited nectar plants by females were two *Moraea* species, namely *M. bifida* and *M. miniata* (39.2%). Other flowers commonly visited were *Oxalis pes-caprae*, *O. obscura* (22.3%) and *Arctotheca calendula* (16.1%). Visits of the remaining 22.4 per cent of females were divided among the following plants: *Bulbinella floribunda*, *Erodium cicutarium*, *Geissorrhiza aspera*, *Griellum humifusum*, *Nemesia cheiranthus*, *N. leipoldtii*, *Polycarena* sp., *Polygala* sp., *Raphanus raphanistrum*, *Romulea* sp., *Senecio arenarius*, *S. littoreus*, *Wachendorfia* sp., and a *Zygophyllum* sp.

The plant most visited by males was *Arctotheca calendula* (32.0%) followed by *Moraea bifida* and *M. miniata* (26.6%). *Oxalis pes-caprae* and *O. obtusa* accounted for 19.7 per cent of the visits and *Senecio arenarius* and *S. littoreus* for 12.2 per cent. The remaining males were collected on *Cysticapnos vesicaria*, *Lotononis hirsuta*, and on an *Othonna* sp.

#### *Distribution* (Fig. 22)

*Rediviva intermixta* is restricted to the western part of the Western Cape and Northern Cape provinces (Fig. 20). The most northerly collections have been made at Kamieskroon, the limits of the eastern distribution are at Sutherland, and the most southerly populations are found at Stellenbosch and the Tygerberg hills north of Bellville.

#### *Rediviva emdeorum* Vogel & Michener, 1984

Figs 2F, 23–26, 63B

*Rediviva emdeorum* Vogel & Michener, 1984, in Vogel, 1984: 515.

*Rediviva emdeorum* Vogel & Michener, 1985: 362.

#### *Diagnosis*

*Female*. Large bodied (13–16 mm) bees with extremely long (19–26 mm) forelegs. Head and mesosoma black, metasoma largely light brown with variable black areas on T1–T4, T5–T6 black. White to straw-coloured apical hair bands on T1–T4, fimbriae of T5 black, small area of white laterally, fimbriae of T6 black.

*Male*. Smaller (10–13 mm), legs nine-tenths of body length, white apical hair bands on T2–T5. Median lobes of S6 short, sub-truncate apically with long branched hairs, terminal hairs longer than lobe, lateral lobes well developed, strigate, translucent.

#### *Etymology*

Named for the Müller-Doblies family of Berlin whose son Uwe collected the holotype.

#### *Material examined*

*Type material*. *Holotype*: female, farm Grootvlei, west of Kamieskroon, 3017BB, U. Müller-Doblies, 15 Aug. 1979. Deposited in the Natural History

Museum, London. *Other material* (86 ♀♀, 7 ♂♂)—*Northern Cape Province*: 1 ♀, Calvinia, farm Toren, 3119BC, KES, 26 Aug. 1985; 1 ♀, Calvinia, farm Witputs, 3119DB, VBW, 28 Aug. 1990; 1 ♂, Garagams, 6.1 km east, 3017BD, KES, 28 Aug. 1985; 1 ♀, Garies, farm Doringkraal, 3018CA, VBW, 3 Sept. 1988; 2 ♀♀, 1 ♂, Garies, farm Skuinskraal, 3017DB, KES, 25 Aug. 1990; 2 ♀♀, Garies, farm Skuinskraal, 3017DB, VBW, 25 Aug. 1990; 3 ♀♀, Kamieskroon, farm Bakleikraal, 3018AA, MM, 8 Sept. 1986; 8 ♀♀, same locality, KES, 8 Sept. 1986; 11 ♀♀, same locality, VBW, 8 Sept. 1986; 3 ♀♀, Kamieskroon, farm Grootvlei, 3017BB, KES, 24 Aug. 1990; 6 ♀♀, 1 ♂, same locality, VBW, 24 Aug. 1990; 1 ♀, Kamieskroon, farm Outuin, 3017AA, KES, 7 Sept. 1986; 1 ♀, Kamieskroon, Leliefontein road, 3018AA, KES, 8 Sept. 1986; 1 ♀, same locality, MM, 8 Sept. 1986; 7 ♀♀, 2 ♂♂, Karkams, 3017BD, VBW & MM, 23 Aug. 1985; 1 ♀, same locality, MM, 4 Sept. 1986; 1 ♀, same locality, MM, 6 Sept. 1986; 2 ♀♀, 1 ♂, same locality, VBW, 18 Aug. 1988; 1 ♀, Karkams, 2 km north-east, 3017BD, MM, 7 Sept. 1986; 4 ♀♀, same locality, VBW, 4 Sept. 1986; 1 ♀, Karkams, 6 km north-east, 3017BD, KES, 18 Aug. 1988; 1 ♂, same locality, VBW, 18 Aug. 1988; 2 ♀♀, Karkams, 6.2 km north-east, KES, 4 Sept. 1986; 5 ♀♀, same locality, KES, 6 Sept. 1986; 1 ♀, Loeriesfontein, farm Koopmanskloof, 3019AB, KES, 13 Sept. 1989; 1 ♀, Nieuwoudtville, farm Glenlyon, 3119AC, VBW, 29 Aug. 1985; 1 ♀, same locality, KES, 26 Aug. 1990; 1 ♀, Nieuwoudtville, Grasberg road, 3119AC, KES, 10 Sept. 1986; 2 ♀♀, Springbok, Goegab Reserve, 2917CA, KES, 10 Aug. 1993; 2 ♀♀, Springbok, Hester Malan Reserve (=Goegab Reserve), 2917DB, KES, 25 Aug. 1989. *Western Cape Province*: 1 ♀, 3 ♀♀, Nuwerus, 15 km on Meerhofkasteel road, 3118AB, VBW, 22 Aug. 1993; 2 ♀♀, Nuwerus, 2.3 km west, 3118AB, KES, 21 Aug. 1990; 1 ♀, same locality, KES, 25 Aug. 1990; 1 ♀, Nuwerus, farm Middelputs, 3118AB, KES, 22 Aug. 1989; 2 ♀♀, Nuwerus, Meerhofkasteel road, 3118AB, VBW, 21 Aug. 1990; 3 ♀♀, same locality, VBW, 25 Aug. 1990; 3 ♀♀, Vanrhyn's Pass, foot, 3119AC, VBW, 23 Aug. 1995.

## Description

### Female

*Measurements*. *Holotype*: body 15 mm, foreleg 19 mm, forewing 10.5 mm (Vogel, 1984; Vogel & Michener, 1985). *Other material* (n = 39)—*Measurements and ranges*: body 13.7 mm (12.5–15.5 mm), foreleg 23.4 mm (19.3–26.3 mm), Ft+bt 8.0 mm (7.2–8.7 mm), forewing 10.3 mm (9.7–11, mm). *Ratios*: FL : B (n = 40) 1.7 (1.5–1.9), malar space (n = 20) L : W 0.20 (0.16–0.24).

*Integumental colour*. Head: mouth-parts, scape, pedicel and basal three-quarters of first flagellomere black, rest of flagellum dark brown. Mesosoma: black, wings dusky, veins dark brown to black, legs dark brown, basal third of front tibia light brown. Metasoma: terga with variable areas of black and light brown, T1 anterior surface with two lateral dark spots to all black, T2 black median spot on basal margin, sometimes absent, T3 dark brown to black on basal half of segment, sometimes entirely light brown, T4 entirely black to basal half black, T5 black. Basal sterna light brown becoming darker brown to black at apex of metasoma.



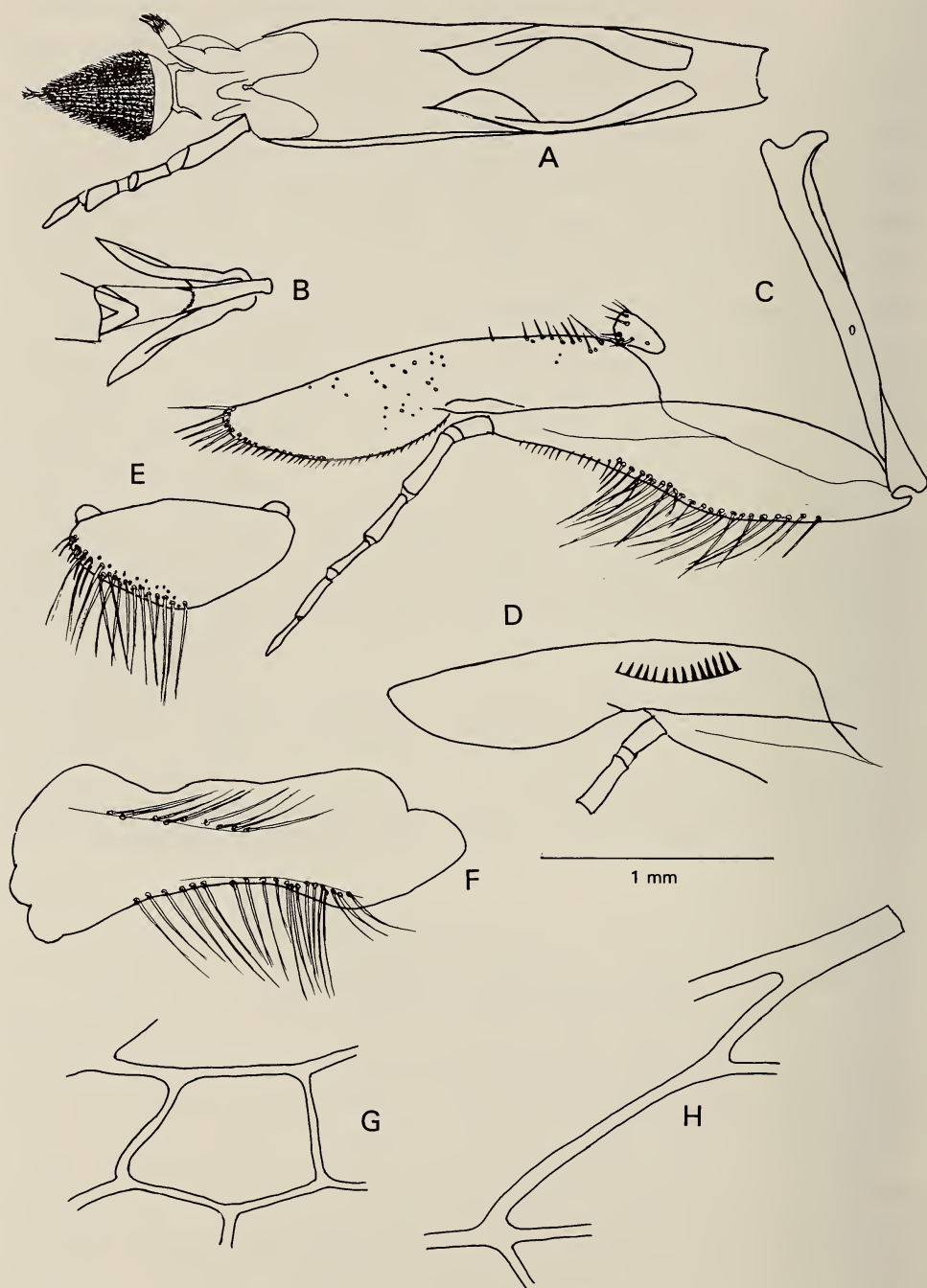


Fig. 23. *Rediviva emdeorum* Vogel & Michener, 1984. Female. A. Labium, anterior view. B. Base of prementum, mentum and lorum, posterior view. C. Left maxilla. D. Inner view of right galea to show galeal comb. E. Labrum. F. Right mandible. G. Second sub-marginal cell of right front wing. H. Basal vein and first abscissa of Rs of right front wing.

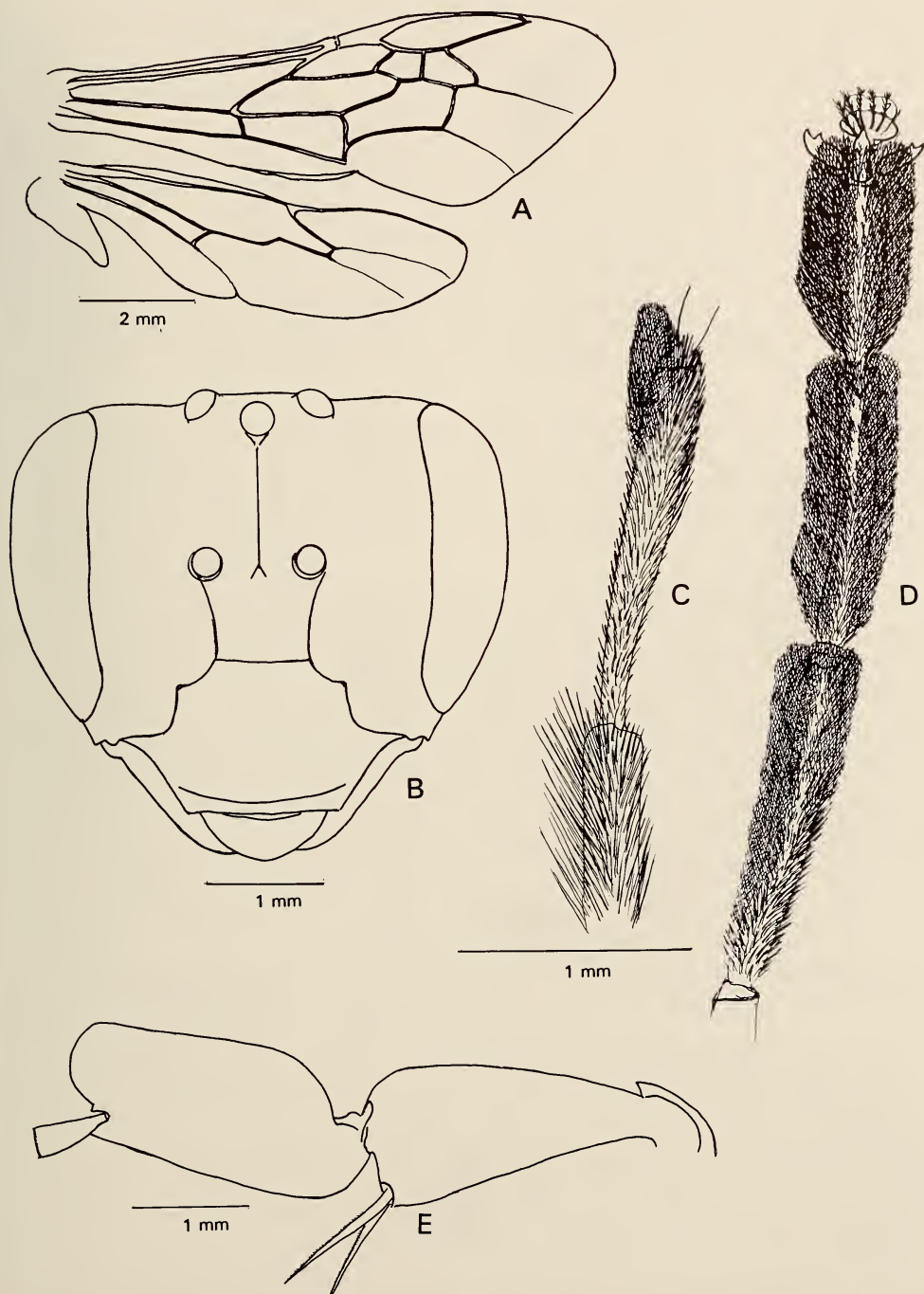


Fig. 24. *Rediviva emdeorum* Vogel & Michener, 1984. Female. A. Right wings. B. Head, anterior view. C. Foreleg, distal part of basitarsus plus tarsomere 2. D. Foreleg, tarsomeres 3-5. E. Hind tibia and basitarsus.

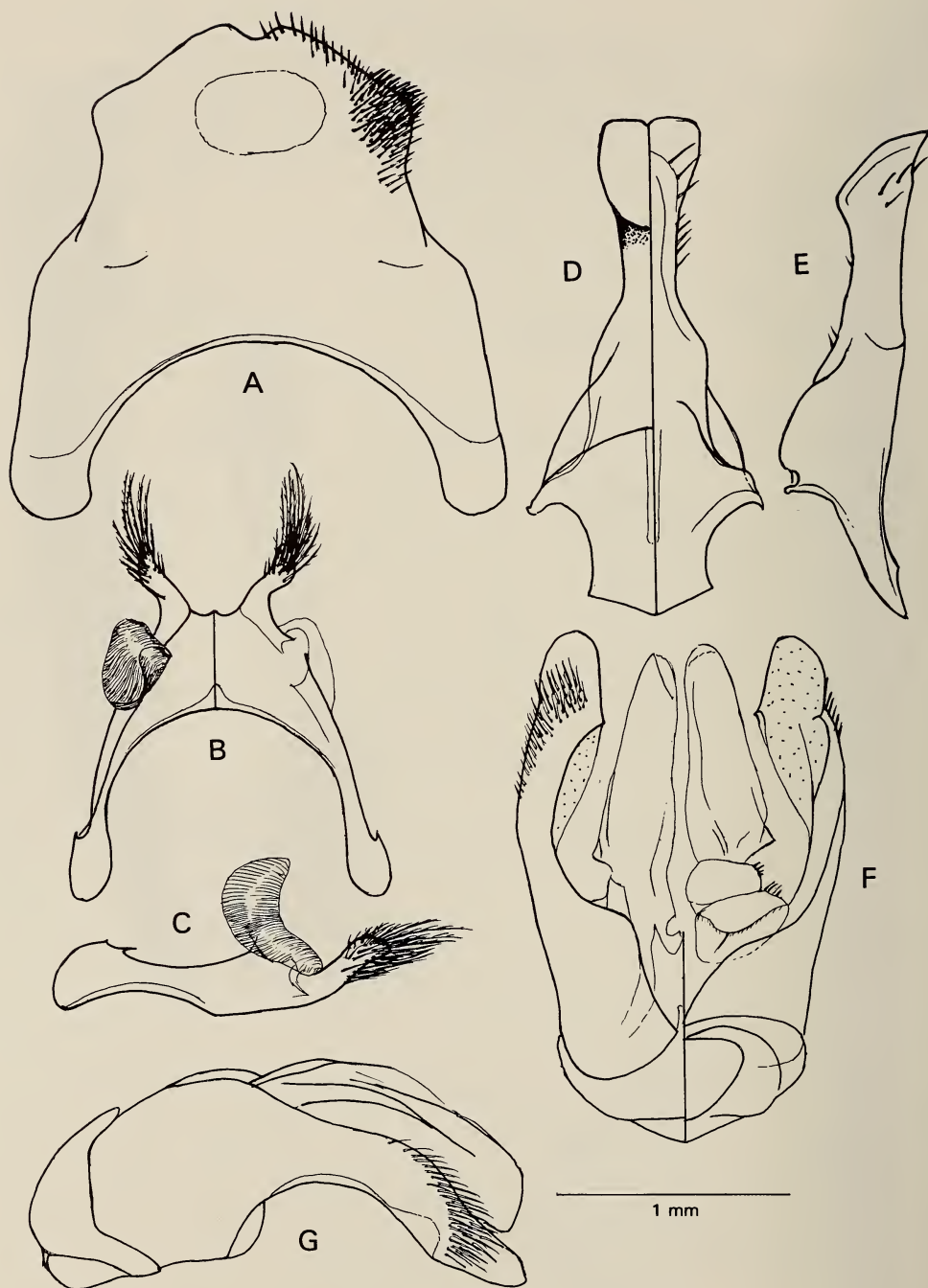


Fig. 25. *Rediviva emdeorum* Vogel & Michener, 1984. Male. A. Ventral aspect of S6. B. Dorsal and ventral view of S7. C. Lateral view of S7. D. S8, dorsal and ventral view. E. Lateral view of S8. F. Dorsal and ventral view of genitalia. G. Lateral view of genital capsule.



*Structure.* Head: wider than long (Fig. 24B); mouth-parts (Fig. 23A–F), glossa short, one-third length of prementum, paraglossae short, half length of suspensorium, reaching to basal third of glossa; labial palps extending to tip of glossa; ligular arms occupying basal half of prementum; cardo (Fig. 23C) as long as stipes, latter with fringe of long branched hairs on lower margin, apex of galea fringed with stout hairs becoming progressively shorter posteriorly, galeal comb of 14 teeth (Fig. 23D); labrum (Fig. 23E) subtriangular twice as wide as long; malar space narrow, length one-fifth of width. Mesosoma: front legs extremely long (19–26 mm), one and three-quarters length of body; hind tibia two and a half times as long as wide, as wide as basitarsus; basitarsus slightly longer than wide, rounded distally and projecting beyond attachment of segment two, distal dorsal scale-like projection absent (Fig. 24E); propodeal triangle well defined but area devoid of hairs, extremely small.

*Sculpture.* Head: basal third of labrum and distal margin of clypeus impunctate, shiny, rest of clypeus with large punctures, greater than their diameter apart, surface between punctures smooth, shiny. Mesosoma: disc of scutum finely punctured, punctures greater than diameter apart, area between punctures smooth, shiny; propodeal triangle faintly coriaceous rest of propodeum costulate, shiny.

*Vestiture.* Head: clypeus, supraclypeal, paraocular and genal areas, frons and scape covered in white plumose hairs, black hairs on inner eye margins and vertex. Mesosoma: shorter straw-coloured pubescence mixed with black hairs on scutum and scutellum, vestiture longer on metanotum and propodeum, similar pubescence on episternal areas; coxa, trochanter and femur of all legs covered in short pale straw-coloured hairs, becoming light brown on tibia and tarsus; oil-collecting hairs on apical quarter of tarsomere 2 (Fig. 24C), most of tarsomere 3 and all of tarsomeres 4–5 (Fig. 24D) of foreleg, no oil-collecting hairs on middle leg. Metasoma: apical hairbands present on T1–T4, white on T1, straw-coloured on T2–T4, T5 fimbriae mostly black, white laterally, T6 fimbriae black.

#### *Male*

*Measurements and ranges* ( $n = 7$ ): body 11.8 mm (10.3–12.8 mm), foreleg 10.5 mm (10.2–10.9 mm), forewing 9.1 mm (8.8–9.7 mm). *Ratios*: FL : B 0.89 (0.80–1.0), malar space L : W 0.21 (0.18–0.25).

*Integumental colour.* Head, scape and pedicellus black, distal half of first flagellar segment and underside of rest of flagellum dark brown. Mesosoma: black, wings clear, veins dark brown; coxa and trochanter of all legs black, femur mostly black, brown at extremities, tibia of hind leg and tarsus of front and middle leg, light brown. Metasoma: variable areas of dark brown to black on tergum; T1 dark brown with small black area at junction with propodeum, to entirely black; T2 median black spot basally, to basal band of black; T3 basal two-thirds black rest of tergum brown, to completely black with lateral brown area; T4–T5 basal half black with lateral area brown, to all black with narrow strip of brown at junction of terga; T6–T7 black.

*Structure.* Forelegs not attenuate, nine-tenths of body length; S6 (Fig. 25A) with median and lateral lobes poorly developed, large translucent area on apical

third; S7 (Fig. 25B-C) median lobes short, sub-truncate apically, adorned with long branched hairs, terminal hairs longer than lobes; well-developed translucent strigate lateral lobes; S8 (Figs 25D-E, 63B) terminating in spade-shaped apical plate with crenulate apical margin. Genital capsule (Fig. 25F-G) with gonoforceps extending a little beyond penis valves, strong unbranched hairs on apical half, not reaching apex; volcellae conspicuous. Vestigial pygideal plate a narrow raised reddish-brown to black bare median area on apical margin of T7.

*Sculpture.* Head: labrum finely punctate except for narrow basal strip without punctures, coarse punctures on clypeus approximately one diameter apart, surface between punctures smooth, shiny. Mesosoma: punctation on disc of scutum fine, several punctures apart, surface between punctures shiny; propodeum with scattered fine punctures, surface costulate.

*Vestiture.* Head: silky white hairs on base and sides of clypeus, paraocular areas and anterior of scape, black hairs on inner eye margins, frons and vertex. Mesosoma: scutum and scutellum with pale straw-coloured hairs and some black hairs on disc; longer pale straw-coloured hairs on metanotum and propodeum; white pubescence on epipleural areas; patch of dark hairs sometimes present on apex of hind tibia and basitarsus. Metasoma: white apical hair bands on T2-T5.

#### *Colour variations*

The extent of black on the reddish-brown background of metasomal terga varies somewhat in females, with the loss of black maculation on the disc of T2 and reduction on the base of T3 in lighter specimens. There is also colour variation in males where the tendency is to be more melanic and the only brown markings on the metasomal terga are apico-lateral triangles on T2 and an apical rim on T1.

#### *Host flower records*

The main oil-host plant of *R. emdeorum* is the long-spurred *Diascia tanyceras*. The majority (80.3%) of females collected were visiting it for their oil requirements. The remaining females were on six other species of *Diascia*, namely, *D. 'whiteheadii'*, *D. namaquensis*, *D. 'tenuis'*, *D. insignis*, *D. macrophylla* and *D. 'floribunda'*. Only 20 females were captured on nectar plants, the majority being taken on *Arctotheca calendula*, *Trachyandra* sp. and *Moraea* sp. Single females were found taking nectar from *Oxalis* sp. and *Lachenalia* sp.

Of the seven males in our collection, six were taking nectar from *Arctotheca calendula* and one from *Moraea*.

#### *Distribution* (Fig. 26)

*Rediviva emdeorum* is restricted to the western parts of the Western Cape and Northern Cape provinces and is the only oil-collecting bee on long-spurred *Diascia* on the coastal plain in the vicinity of Garies and Kamieskroon. Specimens were also collected north of this area at Springbok, and south at Nuwerus. Isolated females have been found on long- and medium-spurred

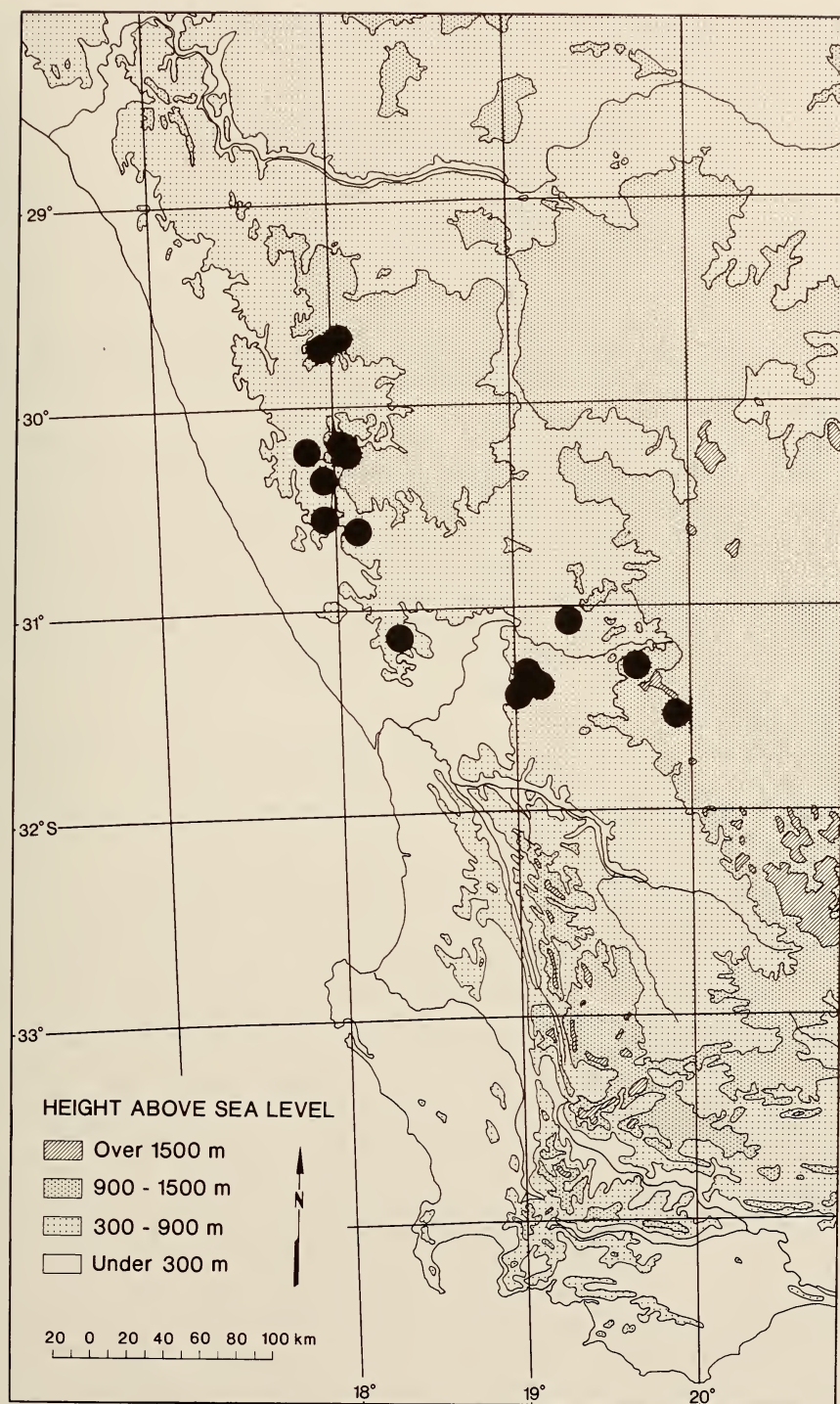


Fig. 26. Known distribution of *Rediviva emdeorum*.



*Diascia* outside the above areas, at Loeriesfontein, Nieuwoudtville, the foot of Vanrhyn's Pass and Calvinia.

*Rediviva longimanus* Michener, 1981

Figs 2E, 27–30, 64A

*Rediviva longimanus* Michener, 1981: 123.

*Rediviva longimanus*: Whitehead *et al.*, 1984: 286.

*Diagnosis*

*Female*. Large (12–16 mm) with black integument and vestiture, forelegs long (18–22 mm), 1.5 times body length, wings dusky. Hair bands not readily discernible on metasoma.

*Males*. Large (9–14 mm), black bodied, forelegs short, three-quarters length of body. Vestiture on T1–T5 black basally, white apically; basal area of black increasing progressively to T4 which is half black; T5 black with narrow apical white fringe, T6–T7 dark brown to black. Males of *R. longimanus*, *R. micheneri* and *R. nitida* are difficult to separate but *R. longimanus* can be recognized by the granular surface between punctures on the scutum. *R. longimanus* males lack the tuft of strong upright bristles on the proximal edge of the apical concavity on S6 and have a small vestigial pygideal plate on T7.

*Material examined*

*Type material*. *Holotype*: SAM-HYM-B002172, female, 5 miles (8 km) north of Nieuwoudtville, S.A.M., 9: 1961. (South African Museum collection.) *Other material* (186 ♀♀, 38 ♂♂)—*Northern Cape Province*: 3 ♀♀, Nieuwoudtville Wild Flower Reserve, 3119AC, KES, 29 Aug. 1985; 2 ♀♀, same locality, MM & VBW, 27 Aug. 1984; 1 ♀, same locality, MM & VBW, 28 Aug. 1984; 1 ♀, same locality, MM & VBW, 10 Sept. 1984; 5 ♀♀, same locality, MM & VBW, 27 Aug. 1985; 1 ♀, 4 ♂♂, same locality, MM & VBW, 28 Aug. 1985; 1 ♀, same locality, VBW, 19 Aug. 1986; 1 ♀, same locality, VBW, 5 Sept. 1986; 1 ♀, same locality, VBW, 24 Sept. 1986; 3 ♀♀, same locality, VBW, 28 Aug. 1995; 1 ♀, same locality, VBW, 20 Sept. 1996; 7 ♀♀, same locality, VBW, 10 Sept. 1996; 1 ♀, Nieuwoudtville, farm Glenlyon, 3119AC, KES, 26 Aug. 1990; 3 ♀♀, same locality, MM & VBW, 29 Aug. 1985; 4 ♀♀, same locality, MM, 10 Sept. 1986; 1 ♀, same locality, VBW, 17 Aug. 1986; 1 ♀, 1 ♂, same locality, VBW, 11 Sept. 1987; 7 ♀♀, same locality, VBW, 26 Aug. 1990; 7 ♀, 1 ♂, Nieuwoudtville, Grasberg road, 3119AC, KES, 10 Sept. 1986; 1 ♀, Nieuwoudtville, farm Lokenberg, 3119CA, KES, 25 Sept. 1986; 1 ♀, Nieuwoudtville, farm Teunisdrif, 3119AC, VBW, 25 Aug. 1988; 1 ♂, Nieuwoudtville, farm Willemsrivier, 3119AC, KES, 28 Aug. 1994; 11 ♂♂, same locality, VBW, 28 Aug. 1994; 1 ♀, Sutherland, farm Kanolfontein, 3220AD, VBW, 22 Sept. 1985. *Western Cape Province*: 1 ♀, 1 ♂, Bidouw Valley, 5 km south, 3219AA, KES, 28 Aug. 1990; 3 ♀♀, same locality, KES, 30 Aug. 1990; 1 ♀, Bidouw Valley, Uitkyk Pass, 3219AA, MM, 25 Aug. 1984; 1 ♀, same locality, VBW, 4 Sept. 1983; 1 ♀, same locality, VBW, 8 Sept. 1983; 2 ♀♀, same locality, VBW, 25 Aug. 1984; 2 ♀♀,

same locality, VBW, 30 Aug. 1990; 2 ♀♀, Botterkloof Pass, farm Piet se Hoek, 3119CD, KES, 30 Aug. 1985; 10 ♀♀, same locality, KES, 15 Sept. 1989; 1 ♀, same locality, VBW, 24 Aug. 1983; 7 ♀♀, Clanwilliam, 3218BB, VBW, 24 Aug. 1983; 3 ♀♀, Clanwilliam, 0.5 km south, 3218BB, VBW, 17 Aug. 1988; 1 ♀, 3 ♂♂, Clanwilliam, 0.6 km north, 3218BB, 11 Aug. 1989; 1 ♀, Clanwilliam, 1 km north, 3218BB, VBW, 12 Aug. 1994; 4 ♀♀, 1 ♂, Clanwilliam, 3 km south, 3218BB, VBW, 18 Aug. 1983; 10 ♀♀, Clanwilliam, 0.5 km north, 3218BB, VBW, 28 Aug. 1988; 1 ♀, 1 ♂, Clanwilliam 5 km south, 3218BB, VBW, 30 Aug. 1993; 3 ♀♀, Clanwilliam, 6.2 km south, 3218BB, VBW, 10 Sept. 1984; 1 ♀, Clanwilliam, 6.3 km south, 3218BB, KES, 20 Aug. 1985; 1 ♀, Clanwilliam, 7 km south, 3218BB, KES, 3 Sept. 1986; 1 ♀, same locality, MM, 3 Sept. 1986; 1 ♀, same locality, VBW, 3 Sept. 1986; 1 ♂, Clanwilliam, farm Holfontein, 3218BD, VBW, 11 Aug. 1981; 10 ♀♀, 4 ♂♂, same locality, VBW, 24 Aug. 1983; 1 ♀♀, same locality, VBW, 3 Sept. 1991; 12 ♀♀, same locality, VBW, 11 Sept. 1991; 1 ♀, Clanwilliam, farm Klawervlei, 3218BD, VBW, 20 Aug. 1984; 1 ♀, Clanwilliam, Pakhuis, 3219AA, MM, 25 Aug. 1984; 2 ♀♀, Clanwilliam, Ramskop Camp Ground, 3218BB, KES, 23 Aug. 1984; 1 ♀, 2 ♂, same locality, MM & VBW, 21 Aug. 1984; 2 ♂♂, same locality, MM & VBW, 22 Aug. 1984; 33 ♀♀, same locality, MM & VBW, 23 Aug. 1984; 2 ♀♀, same locality, VBW, 8 Aug. 1984; 1 ♀, Clanwilliam, farm Rondegat, 3218BD, KES, 24 Sept. 1989; 1 ♀, Sutherland, 64 km south-west, farm Thyskraal, 3220CC, VBW, 26 Sept. 1984; 3 ♀♀, 2 ♂♂, Vanrhyns Pass, 3119AC, VBW, 18 Aug. 1993; 1 ♀, Vanrhyns Pass, 3119AC, VBW, 16 Aug. 1994; 1 ♀, 1 ♂, Wupperthal, 3219AA, VBW, 29 Aug. 1990; 4 ♀♀, same locality, VBW, 30 Aug. 1990.

## Description

### Female

*Measurements.* *Holotype*: body 13.5 mm, forewing 10.3 mm (wing tips frayed), malar space L : W 0.21. *Other material* (n = 59)—*Measurements and ranges*: body 13.5 mm, (11.5–16.3 mm), forewing 10.7 mm, (9.7–11.7 mm), foreleg 20.7 mm (17.7–22.2 mm), Ft+bt 7.1 mm (6.8–7.5 mm). *Ratios*: FL : B 1.54, (1.36–1.75), malar space (n = 10) L : W 0.20 (0.19–0.23).

*Integumental colour.* Head, mandibles, scape, pedicellus and first flagellar segment black, rest of flagellum piceous to dark brown. Mesosoma black, legs and wing veins black to dark brown, wings dusky. Metasoma black.

*Structure.* Mouth-parts (Fig. 27A–F): glossa approximately one-fifth length of prementum, labial palps extending a little beyond tip of glossa, paraglossae reaching to half length of glossa, ligular processes occupying basal half of prementum (Fig. 27A); cardo equal length of stipes, apex of galea rounded (Fig. 27E), galeal comb of 16 teeth (Fig. 27B); labrum 2.5 times as wide as long, apical margin evenly rounded (Fig. 27D). Mesosoma: front legs attenuate 1.5 times length of body, hind tibia as wide as hind basitarsus (38 : 41), length of hind basitarsus 2.25 times width, no scale-like projection on distal dorsal angle (Fig. 28D).

*Sculpture.* Head: clypeus with apical margin largely impunctate, rest of clypeus coarsely punctured, diameter of punctures slightly less than distance

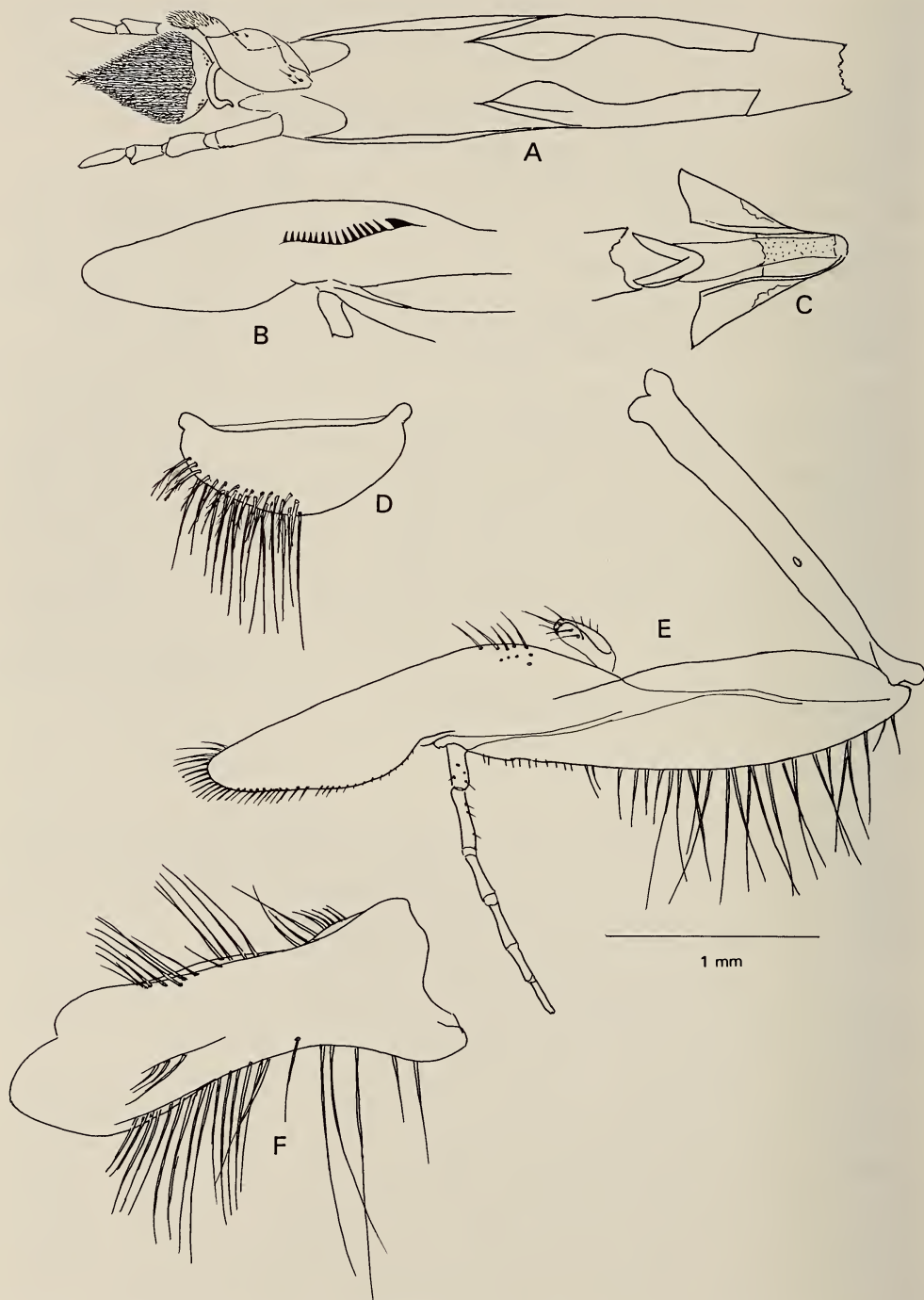


Fig. 27. *Rediviva longimanus* Michener, 1981. Female. A. Labium, anterior view. B. Inner view of galea to show comb. C. Base of prementum with mentum and lorum, posterior view. D. Labrum. E. Left maxilla. F. Left mandible.



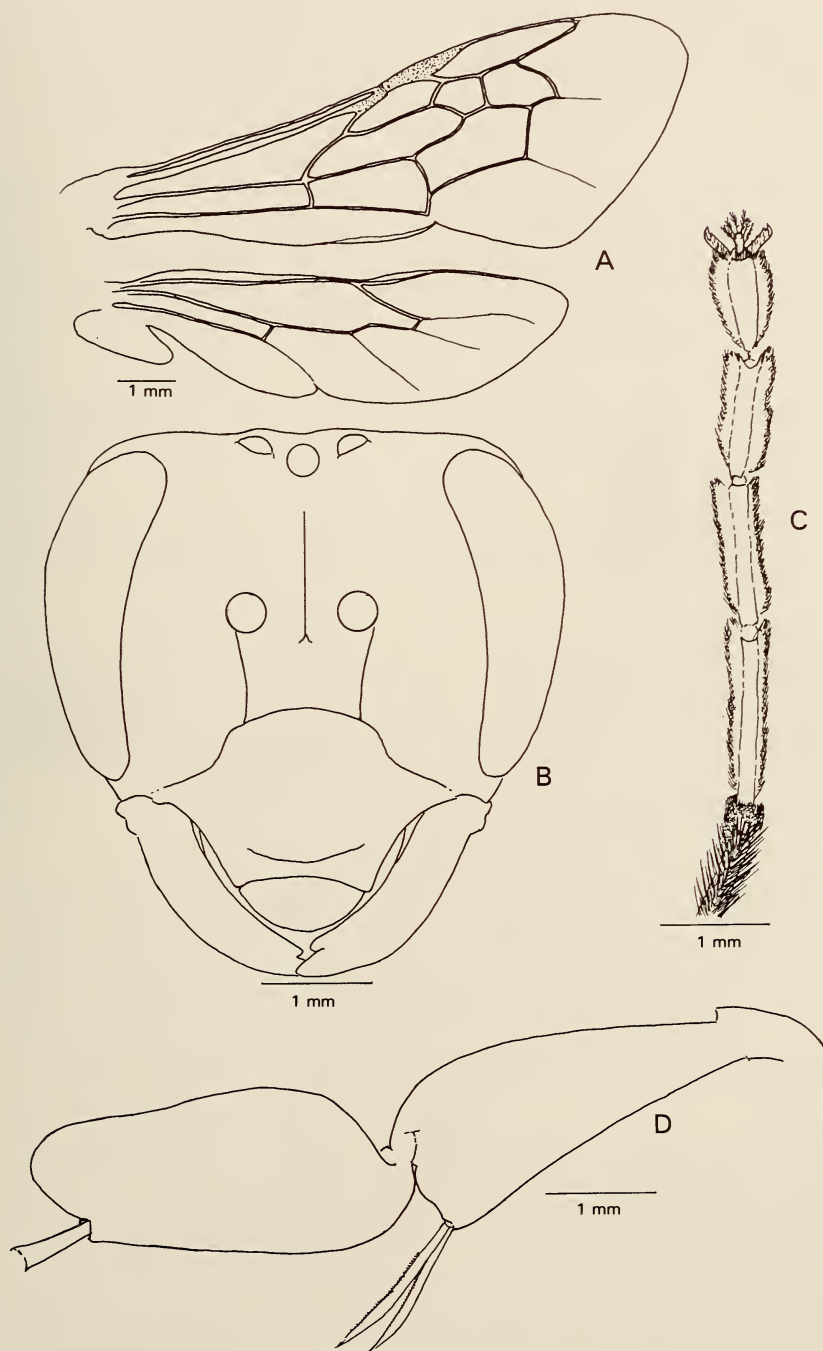


Fig. 28. *Rediviva longimanus* Michener, 1981. Female. A. Right wings. B. Head, anterior view. C. Distal part of basitarsus and tarsomeres 2-5 of front leg. D. Hind tibia and basitarsus.

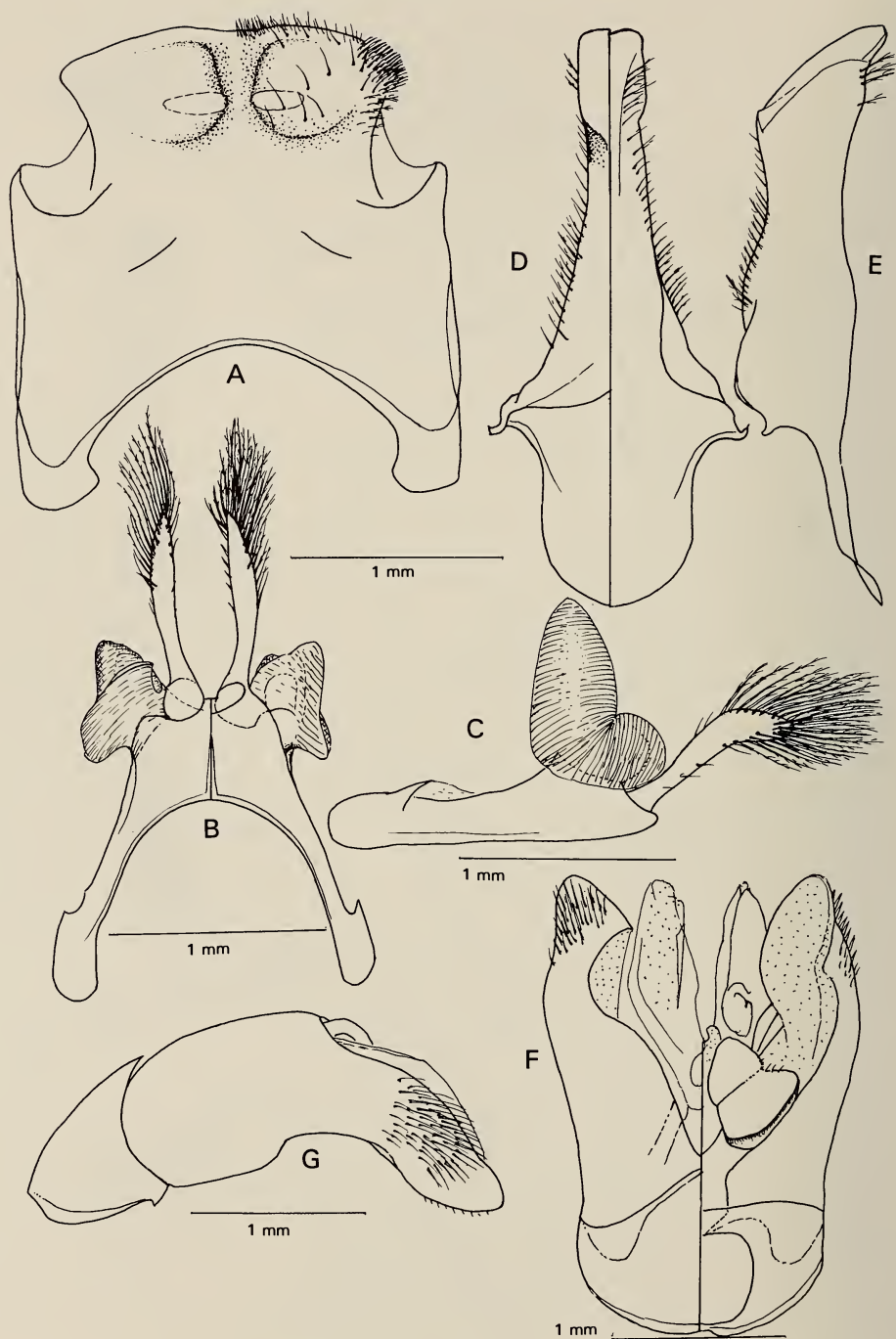


Fig. 29. *Rediviva longimanus* Michener, 1981. Male. A. S6, ventral view. B. S7, dorsal and ventral aspects. C. S7, lateral view. D. S8, dorsal and ventral view. E. S8, lateral view. F. Dorsal and ventral view of genitalia. G. Lateral view of genital capsule.

between them, surface between punctures roughened. Mesosoma: finely and densely punctured on disc, surface between punctures roughened, distance between punctures greater than their diameters; propodeal triangle small, distinct, surface shiny but wrinkled, rest of propodeum shiny with sparse fine punctation, punctures 3.5 times their diameters apart.

*Vestiture.* Head: pubescence black except on apical margin of labrum and mandibles where it is dark brown to piceous. Mesosoma: hairs black except tibia and tarsus of legs which are brown, oil-collecting hairs on apex of basitarsus and on tarsomeres 2–5 of front legs (Fig. 28C). Metasoma: short sub-erect black hairs on disc of T2–T4, longer laterally, on T5–T6 longer and more dense, fimbriae dark brown to black, light brown medially in some specimens.

### *Male*

*Measurements* (n = 20). Body 12.5 mm (9.1–14.2 mm), forewing 9.4 mm (8.7–9.8 mm), foreleg 9.7 mm (8.9–10.6 mm). *Ratios*: FL : B 0.78 (0.74–0.84), malar space L : W 0.22 (0.19–0.25).

*Integumental colour.* Head black, scape and first flagellar segment black, rest of flagellum dark brown above black below. Mesosoma black, legs black, wings clear with veins dark brown. Metasoma black, terga with apical margins piceous.

*Structure.* Forelegs not attenuate, three-quarters to four-fifths length of body; S6 (Fig. 29A) with median lobes poorly developed, lateral lobes indicated by tuft of stiff short bristles; apical third of S6 concave, shiny with slightly raised median area without tuft of erect hairs on proximal part of ridge. S7 (Fig. 29B–C) with long spatulate median lobes, apical third adorned with long branched hairs, hairs at apex half length of lobe; large strigate translucent lateral lobes. S8 (Fig. 29D–E) with apical plate elongate oval, length twice width, evenly rounded distally (Fig. 64A). Genitalia (Fig. 29F–G): apex of gonoforceps not extending beyond ends of penis valves, stout unbranched bristles dorsally on apical third, not reaching apical margin. Vestigial pygideal plate a median narrow shiny raised area on apical margin of T7.

*Sculpture.* Head: labrum shiny, impunctate basally; strong dense punctures on clypeus, distance between punctures less than their diameter, surface between punctures smooth shiny. Mesosoma: scutum with fine punctures, approximately diameter apart, area between punctures dull, granulate; propodeal triangle shiny, faintly strigate.

*Vestiture.* Head: long silky white pubescence on clypeus, paraocular areas and scape. Mesosoma: pale straw-coloured hairs on most of scutum, scutellum and metanotum, some black hairs on disc of scutum and scutellum; similar hairs on propodeum with scattered black hairs on anterior margin; pubescence on legs shorter, pale straw-coloured to light brown, small patch of brown to black hairs on distal tip of basitarsus. Metasoma: T1–T5 covered in long erect, relatively sparse pubescence, black basally white apically, basal bands of black hairs on T1–T3 narrow and sometimes difficult to see, becoming progressively broader with half of T4 black and T5 with nearly all pubescence black on disc. Fringe of white hairs on whole of apical margin or sometimes only laterally, fimbriae on T6–T7 dark brown to black.



### Remarks

Males of *R. longimanus*, *R. micheneri* and *R. nitida* have similar banding patterns on the terga of the metasoma and superficially similar appearance of S6, which make it difficult to separate them. The characters given in Table 1 will help to distinguish males of the three species.

TABLE 1  
Distinguishing characters of the males of *Rediviva longimanus*,  
*R. micheneri* and *R. nitida*.

Character	<i>R. longimanus</i>	<i>R. micheneri</i>	<i>R. nitida</i>
White fringe on apical margin of T5	Present	Present	Absent
Surface between punctures on scutum	Granulate	Smooth, shiny	Smooth, shiny
Apical concavity on S6 with tuft of erect hairs on proximal margin	Absent	Present	Present
Apical patch of dark hair on hind tibia	Absent	Absent	Present

### Host flower records

Of the 134 females collected on oil-producing plants, the majority were on *Diascia* 'whiteheadii' (85.1%) and *D. floribunda* (12.7%). Single females were collected on *D. insignis*, *D. bicornuta* and *D. parviflora*. Most of the 58 females taken on nectar plants were on several species of *Moraea*—65.5% on *M. miniata*, 12.1% on *M. bifida*, 12.1% on *M. fragrans*, 10.3% on *M. tripetala*, which is common in the area, as well as on an unidentified species of *Moraea*.

Males were mostly taken in flight while patrolling nectar plants for receptive females but 25.0% and 11.1% respectively were collected while taking nectar from *M. miniata* and *M. bifida*. Males were also found to visit *Cysticapnos vesicaria* (8.3%) and *M. tripetala* (2.7%) for nectar. Two males were collected on the Van Rhyn's Pass with pollinaria of *Holothrix aspera* attached, presumably while collecting nectar.

### Distribution (Fig. 30)

*Rediviva longimanus* is concentrated around Clanwilliam in the Olifants River valley but extends eastward over the Pakhuis Pass into the Bidouw valley and northwards to the Nieuwoudtville area. Isolated specimens have also been found to the west and south of Sutherland. The type locality, 8 km north of Nieuwoudtville, is on the northern boundary of its range.

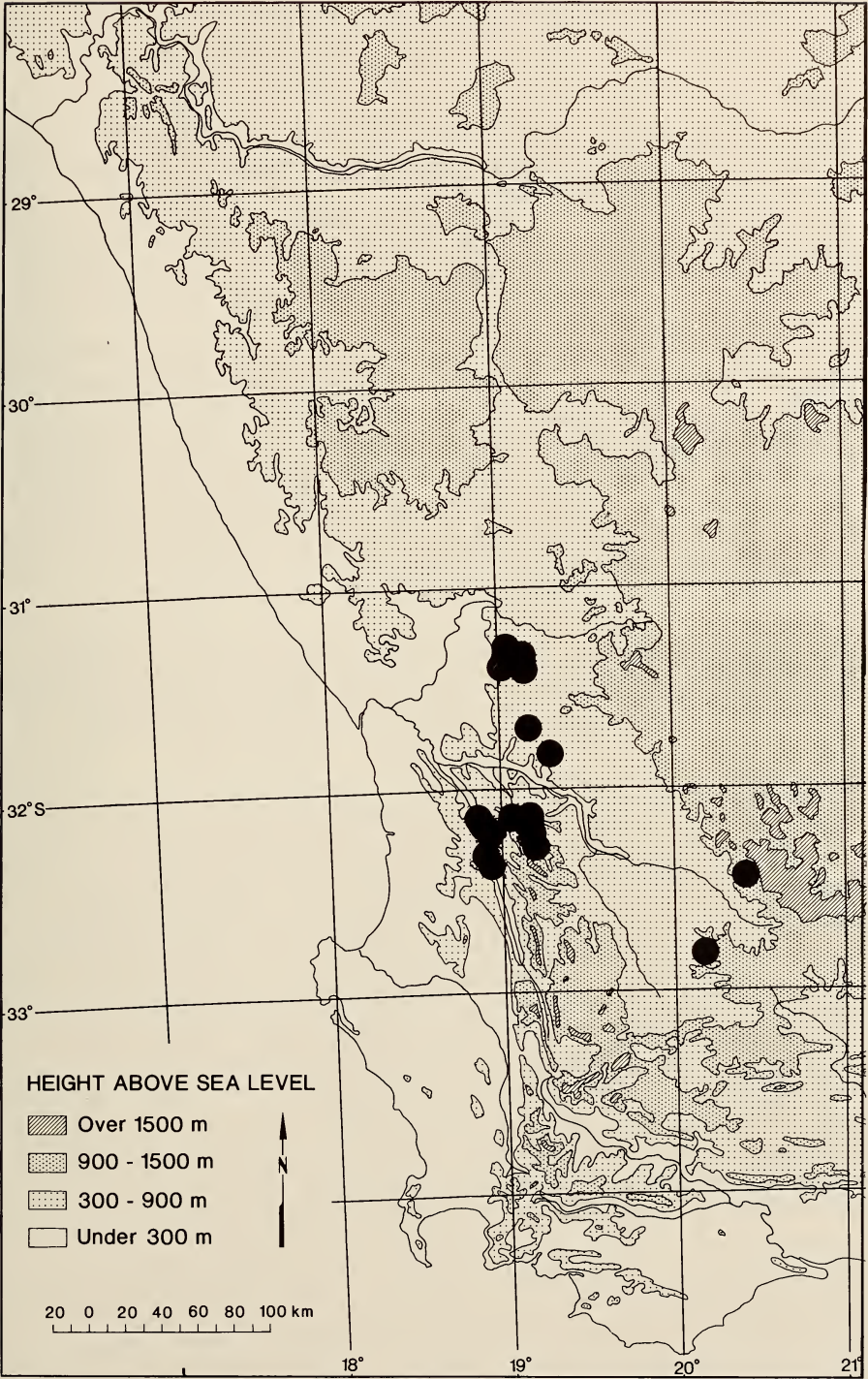


Fig. 30. Known distribution of *Rediviva longimanus*.

*Rediviva macgregori* sp. nov.

Figs 2D, 31–34, 64C

*Diagnosis*

*Female*. Black-bodied medium-sized, 12.5 to 13.5 mm, with front leg equal to or up to one and a quarter times length of body. Malar space narrow, length one sixth of width. Surface between punctures on disc of scutum shiny. Pubescence pale straw-coloured to light brown with diffuse hair bands on apical margin of T1–T4. Fimbriae of T5 and T6 white laterally, light brown medially. Oil-collecting hairs on tarsomeres 2–5 of front legs, absent on middle legs. No scale on dorsal distal angle of hind basitarsus.

*Male*. Black-bodied, 10–12.5 mm in length, malar space as in female. Diffuse straw-coloured apical hair bands on T1–T5, fimbriae of T6 black, of T7 brown. Sub-erect hairs on basal two-thirds of T3–T4 straw-coloured, on T5 with addition of black hairs, on T6–T7 dark brown to black. S6 with poorly developed median and lateral lobes, S7 with short spatulate median lobes densely covered with short plumose hairs, lateral lobes large, strigate and translucent. Short stout unbranched hairs on apical half of gonoforceps, penis valves heavily sclerotized and expanded apically.

*Etymology*

Named for Neil Macgregor of the farm Glenlyon at Nieuwoudtville, who introduced us to the Nieuwoudtville Wild Flower Reserve, allowed us access to his property and on many occasions provided us with accommodation.

*Material examined*

*Type material*. *Holotype*: SAM-HYM-B008048 female, Nieuwoudtville, farm Glenlyon, 3119AC, K. E. Steiner, 29 Aug. 1985. *Allotype*: SAM-HYM-B008049, male, Nieuwoudtville Wild Flower Reserve, 3119AC, V. B. Whitehead, 24 Aug. 1988. *Paratypes* (51 ♀♀, 38 ♂♂)—*Northern Cape Province*: 4 ♀♀, Calvinia, farm Toren, 3119BC, KES, 26 Aug. 1985; 5 ♀♀, same locality, VBW & MM, 26 Aug. 1985; 5 ♀♀, Kamieskroon, farm Bakleikraal, 3018AA, KES, 8 Sept. 1986; 1 ♀, 1 ♂, Kamieskroon, Leliefontein road, 36 km south-east of Gamoep turn off, 3018AA, VBW, 8 Sept. 1986; 2 ♀♀, Middelpoort, farm Hartbeestfontein, 3220CC, KES, 28 Sept. 1984; 2 ♀♀, Nieuwoudtville, farm Glenlyon, 3119AC, KES, 29 Aug. 1985; 2 ♂♂, same locality, VBW, 25 Aug. 1988; 1 ♀, same locality, VBW, 26 Aug. 1990; 5 ♀♀, same locality, VBW & MM, 29 Aug. 1985; 3 ♀♀, Nieuwoudtville Wild Flower Reserve, KES, 26 Aug. 1984; 2 ♀♀, same locality, VBW, 24 Sept. 1986; 2 ♂♂, same locality, VBW, 4 Aug. 1988; 16 ♂♂, same locality, VBW, 28 Aug. 1988; 2 ♂♂, same locality, VBW, 20 Aug. 1990; 1 ♀, same locality, VBW, 28 Aug. 1990; 3 ♀♀, 4 ♂♂, same locality, VBW, 21 Aug. 1996; 3 ♀♀, 1 ♂, same locality, VBW & MM, 26 Aug. 1984; 2 ♂♂, same locality, VBW & MM, 27 Aug. 1984; 4 ♀♀, same locality, VBW & MM, 28 Aug. 1984; 3 ♀♀, same locality, VBW & MM, 27 Aug. 1985; 5 ♂♂, same locality, VBW & MM, 7 Aug. 1986; 4 ♀♀, Sutherland, 4 km south, farm Rooikloof, 3220BC, KES, 27 Sept. 1984; 1 ♀, 1 ♂, same locality, VBW, 27 Sept. 1984; 1 ♂, same



locality, KES, 1 Oct. 1986; 1 ♀, Sutherland, farm Fransplaas, 3220AB, VBW, 4 Oct. 1996. *Other material* (502 ♀♀, 63 ♂♂)—*Northern Cape Province*: 8 ♀♀, Calvinia, farm Toren, 3119BC, KES, 26 Aug. 1985; 2 ♀♀, 3 ♂♂, same locality, MM, 26 Aug. 1985; 13 ♀♀, same locality, VBW & MM, 26 Aug. 1985; 1 ♀, same locality, VBW, 26 Aug. 1985; Calvinia, farm Vanrhynshoek, 3019BD, KES, 14 Aug. 1989; Garies, farm Welkom, 3018CA, KES, 8 Sept. 1986; 1 ♀, same locality, VBW, 30 Sept. 1988; 7 ♀♀, Kamieskroon, farm Bakleikraal, 3018AA, KES, 8 Sept. 1986; 3 ♀♀, same locality, MM, 8 Sept. 1986; 9 ♀♀, same locality, VBW, 7 Sept. 1986; 2 ♀♀, Kamieskroon, farm Dassiefontein, 3018AA, KES, 7 Sept. 1986; 1 ♀, same locality, VBW, 7 Sept. 1986; 1 ♀, Kamieskroon, farm Die Tuin, 3018AA, VBW, 7 Sept. 1986; 1 ♀, Kamieskroon, farm Koringlandkloof, 3018AC, VBW, 30 Sept. 1988; 3 ♀, 1 ♂, Kamieskroon, Leliefontein road, 36 km south-east of Gamoep turn off, 3018AA, VBW, 8 Sept. 1986; 2 ♀♀, Kamieskroon, farm Outuin, 3018AA, KES, 7 Sept. 1986; 2 ♀♀, same locality, VBW, 7 Sept. 1986; 3 ♀♀, Kamieskroon, farm Bakleikraal, 3018AA, MM, 8 Sept. 1986; 1 ♀, Middelpos, 19.6 km north-east, 3120CC, KES, 28 Sept. 1986; 1 ♀, Middelpos, 23 km west, 3120CC, VBW, 28 Sept. 1984; 3 ♀♀, Middelpos, 35 km north-west, 3120CC, VBW, 28 Sept. 1984; 1 ♀, Middelpos, 52 km south, VBW, 27 Aug. 1988; 2 ♀♀, Middelpos, farm Blomfontein, 3120CC, KES, 3 Oct. 1985; 7 ♀♀, same locality, KES, 1 Oct. 1992; 5 ♀♀, same locality, VBW, 3 Sept. 1985; 3 ♀♀, Middelpos, farm Hartbeestfontein, 3120CC, KES, 28 Sept. 1984; 2 ♂♂, same locality, VBW, 27 Aug. 1990; 1 ♀, same locality, VBW, 16 Sept. 1993; 1 ♀, Nieuwoudtville, 5 km south, 3119AC, KES, 11 Sept. 1987; 2 ♀♀, same locality, VBW, 11 Sept. 1987; 7 ♀♀, same locality, VBW, 25 Aug. 1988; 5 ♀♀, same locality, VBW, 27 Sept. 1988; 7 ♀♀, 2 ♂♂, Nieuwoudtville, farm Glenlyon, 3119AC, KES, 29 Aug. 1985; 2 ♀, same locality, KES, 11 Sept. 1987; 9 ♀♀, 2 ♂♂, same locality, VBW & MM, 29 Aug. 1985; 1 ♀, same locality, VBW & MM, 9 Sept. 1987; 3 ♀, 2 ♂♂, same locality, VBW, 11 Sept. 1987; 5 ♀♀, 4 ♂♂, same locality, VBW, 25 Aug. 1988; 8 ♀♀, same locality, VBW, 26 Aug. 1990; 1 ♀, 1 ♂, same locality, VBW, 2 Oct. 1996; 9 ♀♀, same locality, VBW, 3 Oct. 1996; 4 ♀♀, Nieuwoudtville Wild Flower Reserve, 3119AC, KES, 26 Aug. 1984; 1 ♀, same locality, KES, 27 Aug. 1984; 9 ♀♀, same locality, KES, 28 Aug. 1984; 1 ♂, same locality, KES, 27 Aug. 1985; 2 ♂♂, same locality, KES, 19 Aug. 1986; 1 ♀, 3 ♂♂, same locality, KES, 20 Aug. 1986; 1 ♂, same locality, KES, 23 Sept. 1996; 3 ♀♀, same locality, MM, 9 Sept. 1986; 5 ♀♀, same locality, VBW & MM, 24 Aug. 1984; 12 ♀♀, same locality, VBW & MM, 26 Aug. 1984; 4 ♂♂, same locality, VBW & MM, 27 Aug. 1984; 119 ♀♀, 4 ♂♂, same locality, VBW & MM, 27 Aug. 1984; 3 ♀♀, same locality, VBW & MM, 29 Aug. 1984; 2 ♀♀, 4 ♂♂, same locality, VBW & MM, 10 Sept. 1984; 2 ♀♀, same locality, VBW & MM, 11 Sept. 1984; 73 ♀♀, same locality, VBW & MM, 27 Aug. 1995; 9 ♀♀, same locality, VBW & MM, 28 Aug. 1985; 5 ♂♂, same locality, VBW, 2 Aug. 1984; 9 ♀♀, same locality, VBW, 28 Aug. 1984; 5 ♂♂, same locality, VBW, 7 Aug. 1986; 1 ♀, 1 ♂, same locality, VBW, 19 Aug. 1986; 2 ♀, same locality, VBW, 9 Sept. 1986; 9 ♀♀, same locality, VBW, 24 Sept. 1986; 5 ♂, same locality, VBW, 24 Aug. 1988; 3 ♀♀, 4 ♂♂, same locality, VBW, 20 Aug. 1990; 3 ♀♀, 2 ♂♂, same locality, VBW, 24 Aug. 1994; 10 ♀♀, 2 ♂♂, same locality, VBW,

29 Aug. 1995; 10 ♀♀, same locality, VBW, 31 Aug. 1995; 18 ♀♀, same locality, VBW, 5 Sept. 1995; 1 ♀, same locality, VBW, 6 Sept. 1995; 2 ♀♀, same locality, VBW, 28 Sept. 1995; 3 ♂♂, same locality, VBW, 30 Aug. 1996; 1 ♀, 2 ♂♂, same locality, VBW, 10 Sept. 1996; 1 ♂, same locality, VBW, 20 Sept. 1996; 1 ♂, same locality, VBW, 16 Oct. 1996; 1 ♀, Nieuwoudtville, farm Soetwater, on R27, 8.2 km east of R364 junction, 3119AD, KES, 15 Sept. 1989; 2 ♀♀, Sutherland, 4 km south, 3220BC, KES, 27 Sept. 1984; 1 ♀, same locality, VBW, 26 Sept. 1984; 11 ♀♀, same locality, VBW, 27 Sept. 1984; 3 ♀, Sutherland, 27 km west, 3220BA, VBW, 3 Sept. 1985; 5 ♀♀, Sutherland, 29.7 km north-west, 3220AD, VBW, 22 Sept. 1985; 1 ♀, Sutherland, farm Brandwacht, 3220BC, VBW, 14 Sept. 1993; 2 ♀♀, Sutherland, farm Kanolfontein, 3220AD, KES, 22 Sept. 1985; 3 ♀♀, same locality, KES, 1 Oct. 1986; 1 ♀, same locality, VBW, 27 Sept. 1984; 4 ♀♀, Sutherland, farm Kentucky, 3220DC, KES, 17 Sept. 1993; 1 ♀, same locality, VBW, 16 Sept. 1993; 1 ♀, 3 ♂♂, same locality, VBW, 17 Sept. 1993; 1 ♀, Sutherland, farm Rheeboeksfontein, 3220DC, KES, 15 Sept. 1993; 1 ♂, Sutherland, farm Rooikloof, 3220BC, KES, 1 Oct. 1986; 2 ♀♀, same locality, KES, 16 Sept. 1993; 2 ♀♀, same locality, KES, 19 Sept. 1993; 9 ♀♀, same locality, VBW, 20 Sept. 1986; 1 ♀, same locality, VBW, 16 Sept. 1993; 2 ♀♀, Sutherland, Ouberg Pass road, farm Tweeriviere, 3220AD, KES, 1 Oct. 1986. *Western Cape Province*: 1 ♀, 1 ♂, Laingsberg, 30 km west, farm Matjiesfontein, 3320BA, VBW, 15 Sept. 1993; 1 ♀, Sutherland, 82 km south, farm Fortuin, 3220DC, VBW, 21 Sept. 1985; 1 ♀, 1 ♂, Sutherland, farm Thyskraal, 3220CC, VBW, 26 Sept. 1984.

### *Description*

#### *Female*

*Measurements. Holotype*: body 13.5 mm, forewing 10.2 mm, malar space L : W 0.2. *Other material* (n = 15)—*Measurements and ranges*: body 12.8 mm (11.8–13.3 mm), forewing 10.3 mm (9.2–12.0 mm), foreleg 14.7 mm (13.0–15.1 mm), Ft+bt 5.5 mm (4.6–5.9 mm). *Ratios*: FL : B 1.14 (1.06–1.24), malar space L : W 0.17 (0.15–0.20).

*Integumental colour*. Head black, antennae, legs and body dark brown to black.

*Structure*. Mouth-parts (Fig. 31A–F): glossa short, one-third length of prementum, labial palps extending little beyond tip of glossa, ligular arms occupying basal half of prementum (Fig. 31A); maxilla (Fig. 31E) with stipes slightly longer than cardo, having long hairs on lower margin, basal segment of maxillary palp with long stout hairs; galea as long as stipes with short hairs on apical margin, galeal comb of 16 teeth (Fig. 31C); labrum (Fig. 31D) three times as broad as long (58 : 20), anterior margin shallowly convex with long unbranched hairs on apical third. Mesosoma: front legs longer than body, hind tibia (Fig. 31G) slightly narrower than basitarsus (3.3 : 3.4), hind basitarsus trapezoidal, a little more than twice as long as wide (7.5 : 3.5), no scale on distal dorsal angle.

*Sculpture*. Head: labrum with apical two-thirds punctate; clypeus and supraclypeal area coarsely punctate, distance between punctures less than their

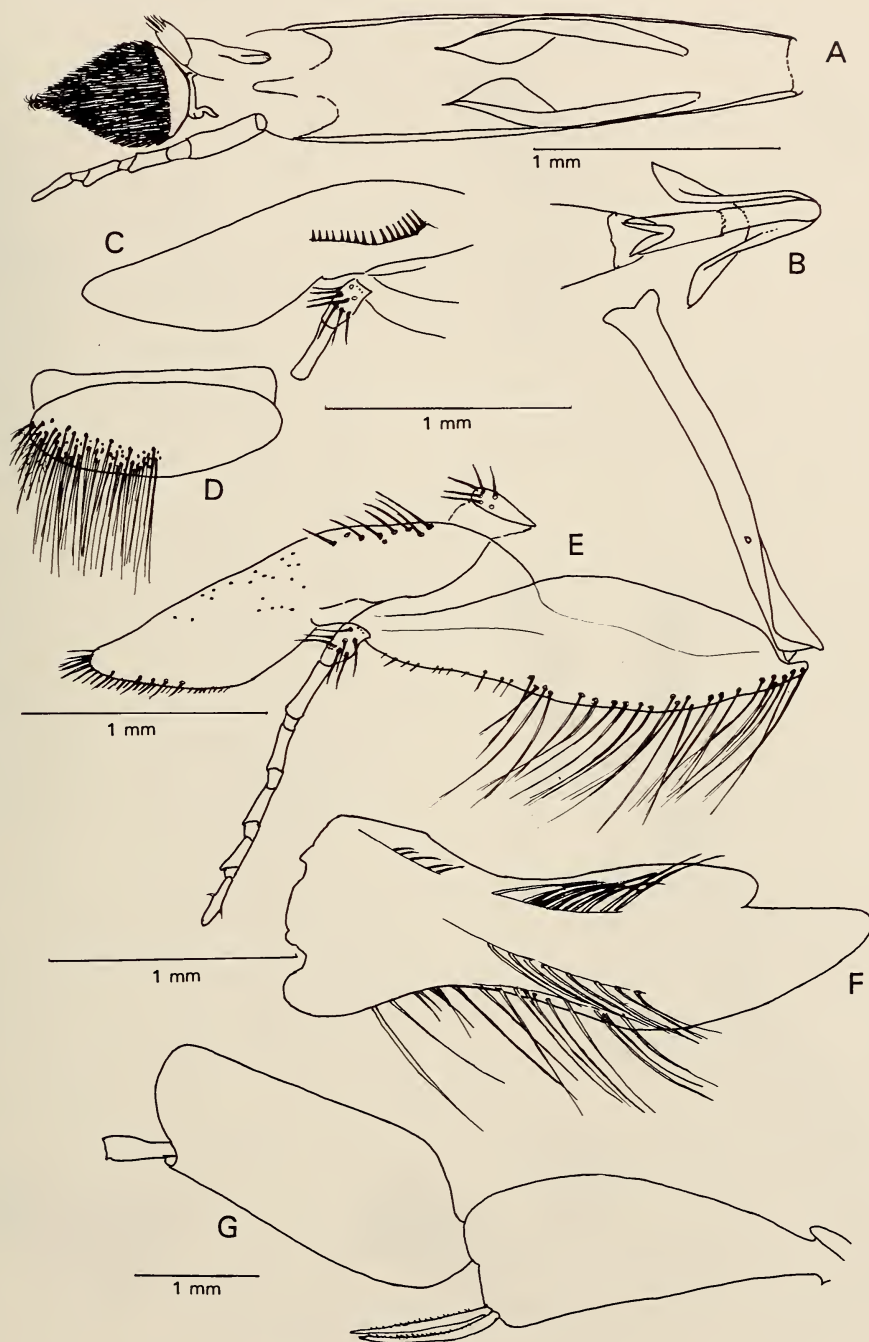


Fig. 31. *Rediviva macgregori* sp. nov. Female. A. Labium, posterior view. B. Base of labium, anterior view. C. Inner view of galea to show comb. D. Labrum. E. Left maxilla. F. Right mandible. G. Hind tibia and basitarsus.



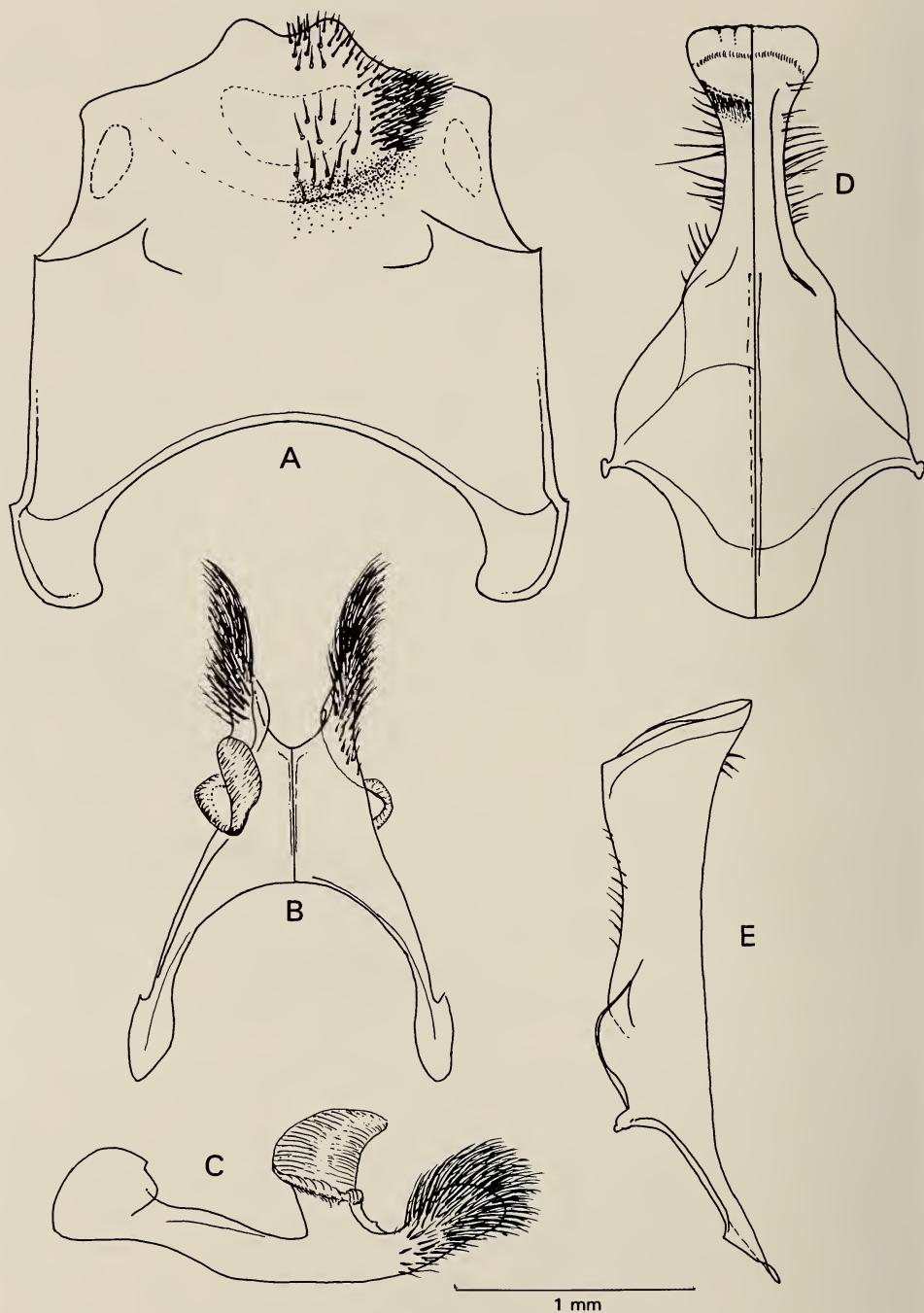


Fig. 32. *Rediviva macgregori* sp. nov. Male. A. S6, ventral view. B. Dorsal and ventral view of S7. C. Lateral view of S7. D. Dorsal and ventral aspects of S8. E. Lateral aspect of S8.

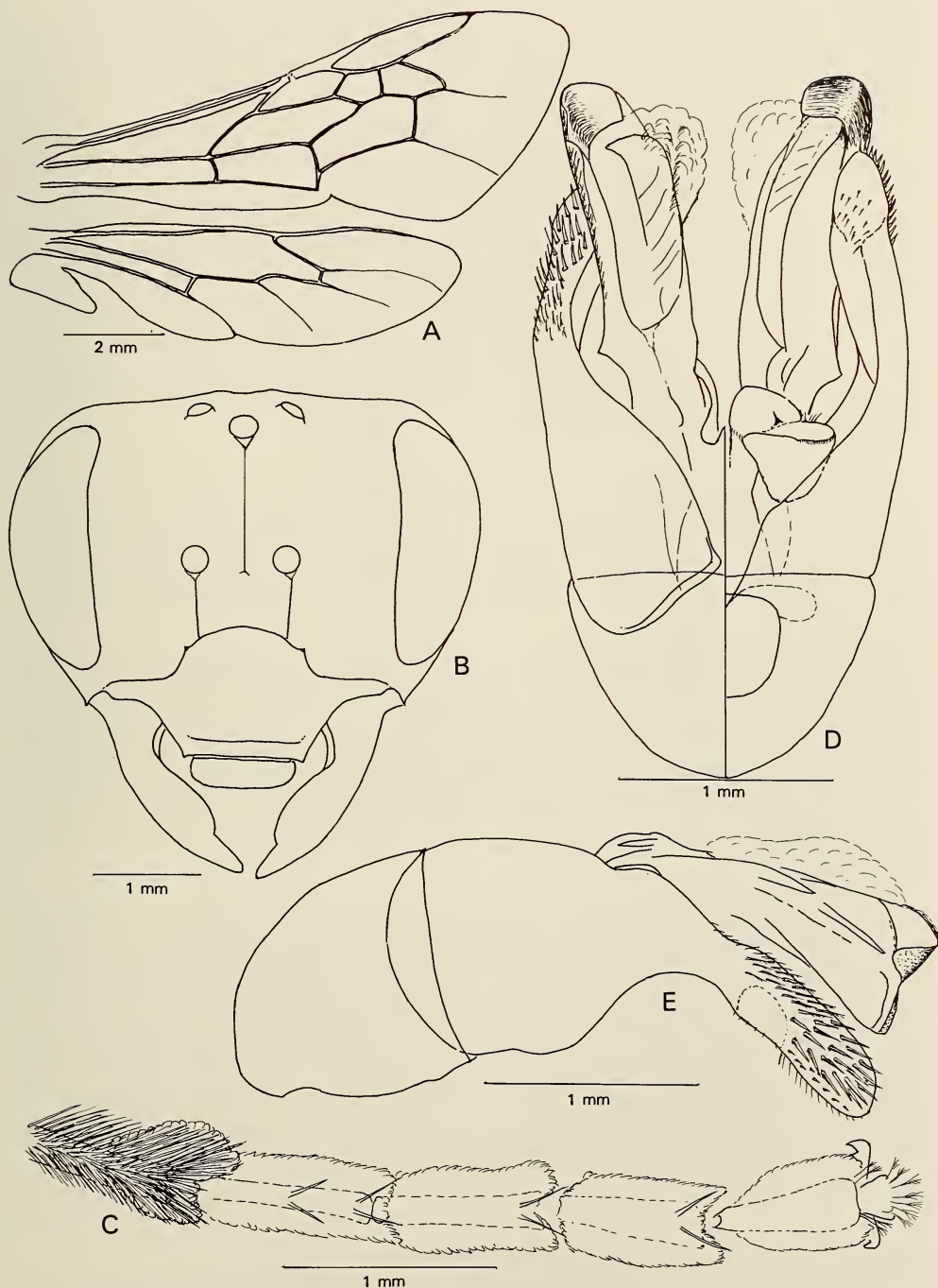


Fig. 33. *Rediviva macgregori* sp. nov. A-C. Female. A. Right wings. B. Anterior view of head. C. Distal part of front basitarsus plus tarsomeres 2-5. D-E. Male genitalia. D. Dorsal and ventral view of genitalia. E. Genital capsule, lateral view.

diameter, surface between punctures smooth, shiny. Mesosoma: punctation on disc of scutum finer than on clypeus and more widely spaced, distance between punctures greater than their diameters, surface between punctures shiny; propodeal triangle small, poorly defined, impunctate, shiny.

*Vestiture.* Head: long light brown unbranched hairs mixed with shorter plumose hairs on apical two-thirds of labrum, white to pale straw-coloured branched hairs on paraocular and supraclypeal area, shorter and less dense on clypeus; erect black branched hairs along ocular carinae. Mesosoma: pubescence on scutum, scutellum and metanotum light brown, longer and paler on propodeum and episternum; legs with similar vestiture, but hairs on tibiae and tarsi light brown; oil-collecting hairs on distal tip of basitarsus and on tarsomeres 2–5 of foreleg (Fig. 31C); no oil-collecting hairs on tarsus of middle legs. Metasoma: diffuse straw-coloured hair bands on apical margin of T1–T4, shorter pubescence of similar colour on basal two-thirds; fimbriae on T5 and T6 white laterally, light brown medially.

### *Male*

*Measurements.* *Allotype:* body 11.8 mm, forewing 8.7 mm, malar space L : W 0.16. *Other material* (n = 10)—*Measurements and ranges:* body 11.4 mm (10.0–12.3 mm), forewing 9.1 mm (8.5–9.8 mm), foreleg 9.1 mm (8.7–9.7 mm). *Ratios:* FL : B 0.80 (0.76–0.86), malar space L : W 0.19 (0.17–0.22).

*Structure.* Front legs not attenuate, four-fifths length of body. S6 (Fig. 32A) with median and lateral lobes poorly developed, disc shallowly concave. S7 (Fig. 32B–C) having short apically rounded median lobes densely covered in short branched hairs; large translucent strigate lateral lobes. S8 (Fig. 32D–E, 64C) with broadly oval apical plate, distal margin shallowly crenulate. Genitalia (Fig. 33D–E): gonoforceps extending slightly beyond penis valves with short stout unbranched hairs on apical half; penis valves heavily sclerotized, apices slightly expanded.

*Sculpture.* As in female.

*Vestiture.* Head: long white plumose hairs on paraocular and supraocular areas, shorter and less dense on clypeus; light brown unbranched hairs on apical third of labrum. Mesosoma: scutum, scutellum, metanotum, propodeum and epipleural areas clothed in pale straw-coloured branched hairs (darker hairs on scutellum of more melanic individuals); legs with similar pubescence except being straw-coloured to light brown at extremities. Metasoma: T1–T5 with diffuse straw-coloured to light brown hair bands on apical margin, fimbriae of T6 black, of T7 brown; sub-erect hairs on basal two-thirds of disc on T3 and T4 straw-coloured, on T5 mixture of straw-coloured and black, on T6 black, on T7 dark brown to black.

### *Colour and banding of males of R. macgregori*

The apical hair bands on the metasomal terga of males are not as distinct as on females. On the basal two-thirds of the disc of T2–T5 hair is erect whereas on the apical margin it is sub-erect forming a diffuse band. On T6 and T7 the pubescence is decumbent.



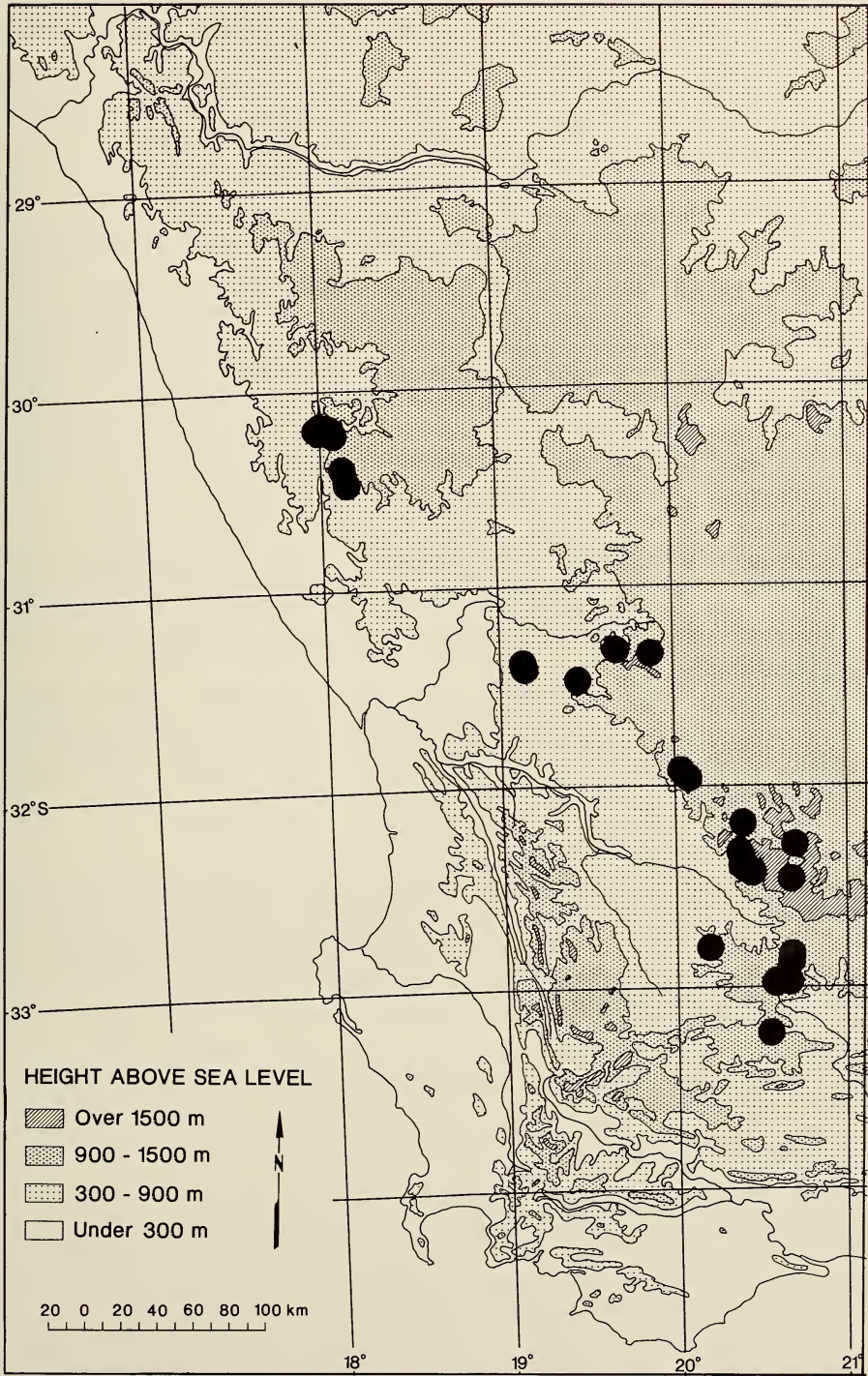


Fig. 34. Known distribution of *Rediviva macgregori* sp. nov.

The colour of the pubescence, particularly on the terminal segments, can be diagnostic. In this species hairs on the disc of T1–T4 are of the general body colour, pale straw-coloured, or a light reddish-brown in individuals that emerge early in the season. T5 has mostly pale straw-coloured hairs but there is a varying amount of black mixed in, whereas on T6 hairs are black and on T7 they are light brown.

#### *Host flower records*

Females of *R. macgregori* collect oil from a wide range of oil-producing plants including 10 *Diascia*, three *Hemimeris*, one *Alonsoa* and three terrestrial orchid species. The greatest number of bees collected were visiting *Diascia* 'floribunda' (35.6%), *D. macrophylla* (15.5%), *Hemimeris centrodes* (14.8%), *D. cardiosepala* (9.7%) and *D. tanyceras* (9.5%). The remaining 11% of bees were collected taking oil from *Alonsoa unilabiata*, *Diascia veronicoides*, *D. dissimulans*, *D. lewisiae*, *D. parviflora*, *D. insignis*, *D. 'whiteheadii'*, *Hemimeris racemosa* and *H. sabulosa*. Only 4 per cent visited three terrestrial orchids, *Pterygodium hallii*, *Corycium deflexum* and *Disperis purpurata*.

*Moraea bifida* and *M. tripetala* were the main nectar plants visited by females but several specimens were also collected on *Bulbinella nutans*, *Arctotheca calendula* and *Nemesia leipoldtii*. *Spiraxis elegans* and *Hesperantha cucullata* were also visited occasionally by females but probably more for pollen than nectar.

Males were found to visit mainly *Arctotheca calendula*, *Moraea bifida* and *Senecio littoreus* for nectar, but several were collected on *Dimorphotheca pluvialis*, *Lotononis hirsuta*, *Moraea tripetala*, *Gynandris pritzeliana*, *Felicia* and *Othonna* sp.

#### *Distribution* (Fig. 34)

*Rediviva macgregori* is restricted mainly to the western edge of the Karoo erosion escarpment, from the high lying areas of the Kamiesberg through Nieuwoudtville, Calvinia and south-east to Sutherland. Only two collections have been made off the escarpment, at the farm Thyskraal south-west south of Sutherland, and at Matjiesfontein.

#### *Rediviva micheneri* sp. nov.

Figs 2B, 35–38, 63H

#### *Diagnosis*

*Females*. Black-bodied, large, 10–14 mm, forelegs long, 15–18 mm, 1.4 times length of body, oil-collecting hairs on tarsomeres 2–5 of forelegs only. Malar space relatively long, one-third of width. Hairs on metasomal terga straw-coloured, short, decumbent, no apical hair bands.

*Males*. Black-bodied, large, 11–12 mm, malar space relatively long, one-third width. White erect hairs on anterior two-thirds of T1–T4, black on T5–T6. S6 with anterior third concave, median cluster of erect black hairs on proximal

edge of concavity. S7 with well-developed spatulate anterior lobes, apical hairs about two-thirds length of lobe.

### *Etymology*

Named for Dr C. D. Michener, Professor Emeritus in Entomology and Systematics at the University of Kansas, for his contribution to the understanding of South African bees and in particular for his revision of the Melittidae. He recognized a single female of this species in the collection of the South African Museum as a new species, possibly related to *R. longimanus*.

### *Material examined*

*Type material. Holotype:* SAM-HYM-B008050, female, Western Cape, Sauer, farm Suurfontein, 3218DC, V. B. Whitehead, 9 Sept. 1994. *Allotype:* SAM-HYM-B008051, male, Western Cape, Sauer, farm Suurfontein, 3218DC, V. B. Whitehead, 1 Sept. 1994. *Paratypes* (121 ♀♀, 7 ♂♂)—*Western Cape Province:* 3 ♀♀, Citrusdal 13.4 km north, 3218BD, KES, 10 Sept. 1984; 1 ♀, Citrusdal 13.5 km north, 3218BD, VBW, 10 Sept. 1984; 1 ♀, Citrusdal, farm Korhaanshoogte, 3218BD, MM & VBW, 21 Aug. 1985; 1 ♀, Clanwilliam, 0.5 km north, 3218BB, VBW, 17 Aug. 1988; 1 ♀, Clanwilliam, 6.2 km south, 3218BB, KES, 30 Aug. 1986; 2 ♀♀, Clanwilliam, 7.0 km south, 3218BB, MM & VBW, 3 Sept. 1986; 1 ♀, same locality, VBW, 3 Sept. 1986; 2 ♀♀, Clanwilliam, Grey's Pass, 3218DB, KES, 9 Sept. 1989; 1 ♀, Clanwilliam, farm Holfontein, 3218DB, KES, 11 Sept. 1991; 1 ♀, Clanwilliam, Ramskop Campground, 3218BB, MM & VBW, 30 Aug. 1985; 1 ♀, Gouda, Voëlvllei, water purification works, 3319AC, VBW, 6 Sept. 1988; 1 ♀, Het Kruis, Eendekuil road, 3218DB, KES, 8 Sept. 1987; 7 ♀♀, Hetkruis, farm Groenfontein, 3218DC, KES, 10 Sept. 1990; 12 ♀♀, same locality, VBW, 30 Aug. 1986; 1 ♀, Hetkruis, farm Groenfontein, 3218DB, VBW, 30 Aug. 1987; 1 ♀, same locality, VBW, 8 Sept. 1987; 1 ♀, same locality, VBW, 22 Aug. 1988; 1 ♀, 1 ♂, same locality, VBW, 8 Sept. 1987; 1 ♀, same locality, VBW, 7 Sept. 1988; 4 ♂♂, same locality, VBW, 23 Aug. 1991; 1 ♀, same locality, VBW, 28 Aug. 1991; 3 ♀♀, Hetkruis, farm Kromrivier, 3218DB, KES, 22 Aug. 1991; 2 ♀♀, Hopefield, farm Jantjiesfontein, 3218CD, VBW, 12 Sept. 1991; 1 ♀, Malmesbury, road to dump, 3318BC, KES, 16 Sept. 1987; 1 ♀, same locality, KES, 20 Sept. 1994; 3 ♀♀, same locality, VBW, 16 Sept. 1992; 8 ♀♀, same locality, VBW, 14 Sept. 1994; 7 ♀♀, same locality, VBW, 20 Sept. 1994; 1 ♀, same locality, VBW, 14 Sept. 1995; 3 ♀♀, same locality, VBW, 22 Sept. 1995; 6 ♀♀, Piketberg, farm Dezehoek, 3218DC, VBW, 15 Sept. 1994; 1 ♀, same locality, KES, 13 Sept. 1994; 2 ♀♀, same locality, KES, 13 Sept. 1994; 1 ♀, Piketberg, Kromrivier, 3218DB, KES, 30 Aug. 1986; 1 ♀, Piketberg, Versveld Pass, 3218DD, VBW, 15 Sept. 11 ♀♀, Sauer, farm Groenfontein, 3218DC, VBW, 10 Sept. 1990; 5 ♀♀, Sauer, farm Hartebeestrivier, 3218DC, KES, 10 Sept. 1990; 3 ♀♀, same locality, VBW, 10 Sept. 1990; 2 ♀♀, same locality, VBW, 23 Aug. 1991; 1 ♀, same locality, VBW, 20 Sept. 1991; 1 ♀, same locality, VBW, 10 Sept. 1992; 4 ♀♀, Sauer, farm Suurfontein, 3218DC, KES, 20 Sept. 1991; 2 ♀♀, same locality, KES, 25 Sept. 1994; 1 ♀, same locality, VBW, 25 Aug. 1994; 1 ♀, 1 ♂, same locality, VBW, 1 Sept. 1994; 6 ♀♀, same locality, VBW, 9 Sept. 1994.



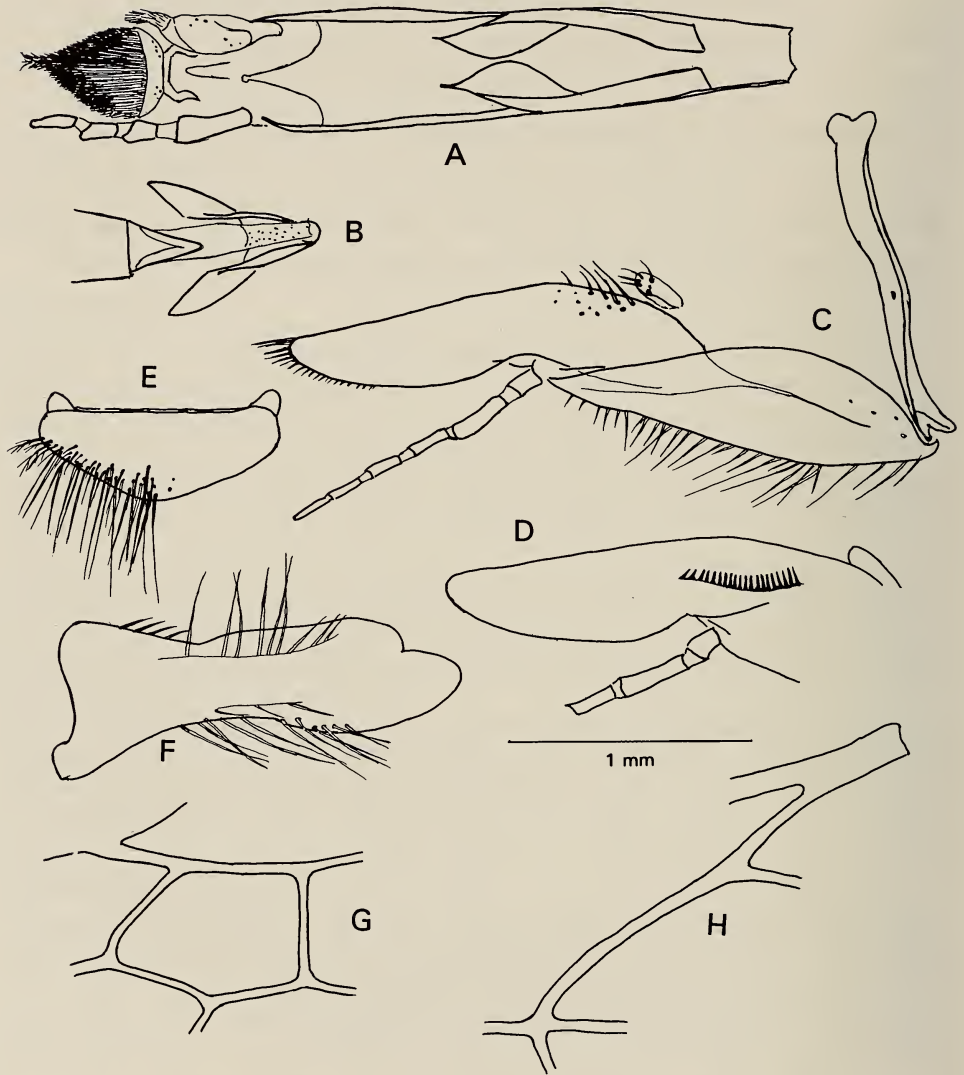


Fig. 35. *Rediviva micheneri* sp. nov. Female. A. Labium, anterior aspect. B. Base of prementum, mentum and lorum, posterior view. C. Maxilla. D. Inner aspect of galea to show comb. E. Labrum. F. Right mandible. G. Second submarginal cell of right wing. H. Basal vein and first abscissa of Rs of front right wing.

### Description

#### Female

**Measurements.** *Holotype*: body 13.0 mm, forewing 10.0 mm, malar space L : W 0.32. *Other material* (n = 30)—*Measurements and ranges*: body 12.2 mm, (10.5–13.0 mm), forewing 10.1 mm, (9.3–10.7 mm), foreleg 16.7 mm (15.5–17.9 mm), Ft+bt 6.0 mm (5.6–6.3 mm). Ratios: FL : B 1.4, (1.4–1.5), malar space L : W 0.32 (0.29–0.38).

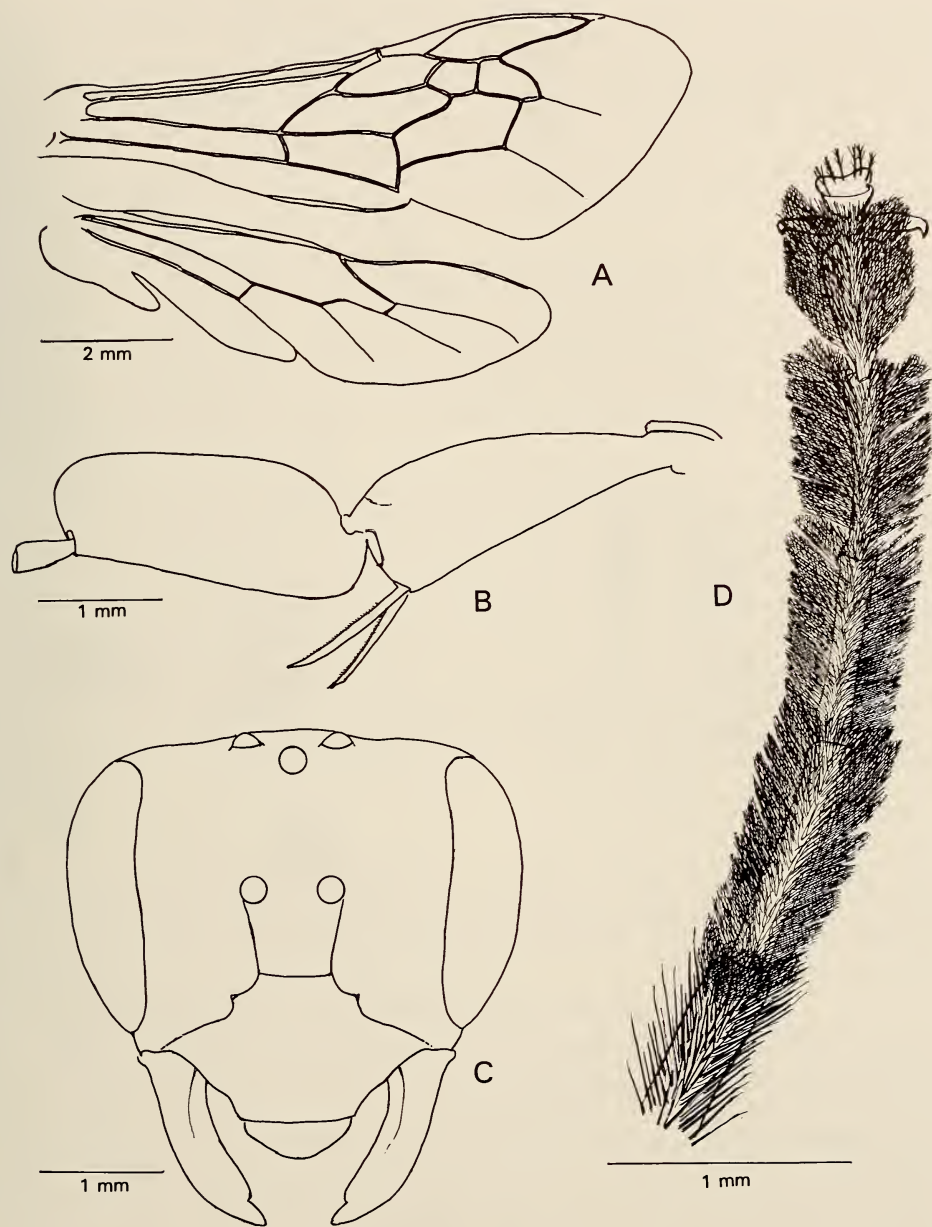


Fig. 36. *Rediviva micheneri* sp. nov. Female. A. Right wings. B. Hind tibia and basitarsus. C. Anterior view of head. D. Distal part of front basitarsus and tarsomeres 2-5.

*Integumental colour.* Head, antennae, mesosoma, legs and metasoma black, tegulae piceous.

*Structure.* Mouth-parts (Fig. 35A-F): glossa short one-quarter length of prementum, labial palps reaching tip of glossa, ligular arms occupying basal

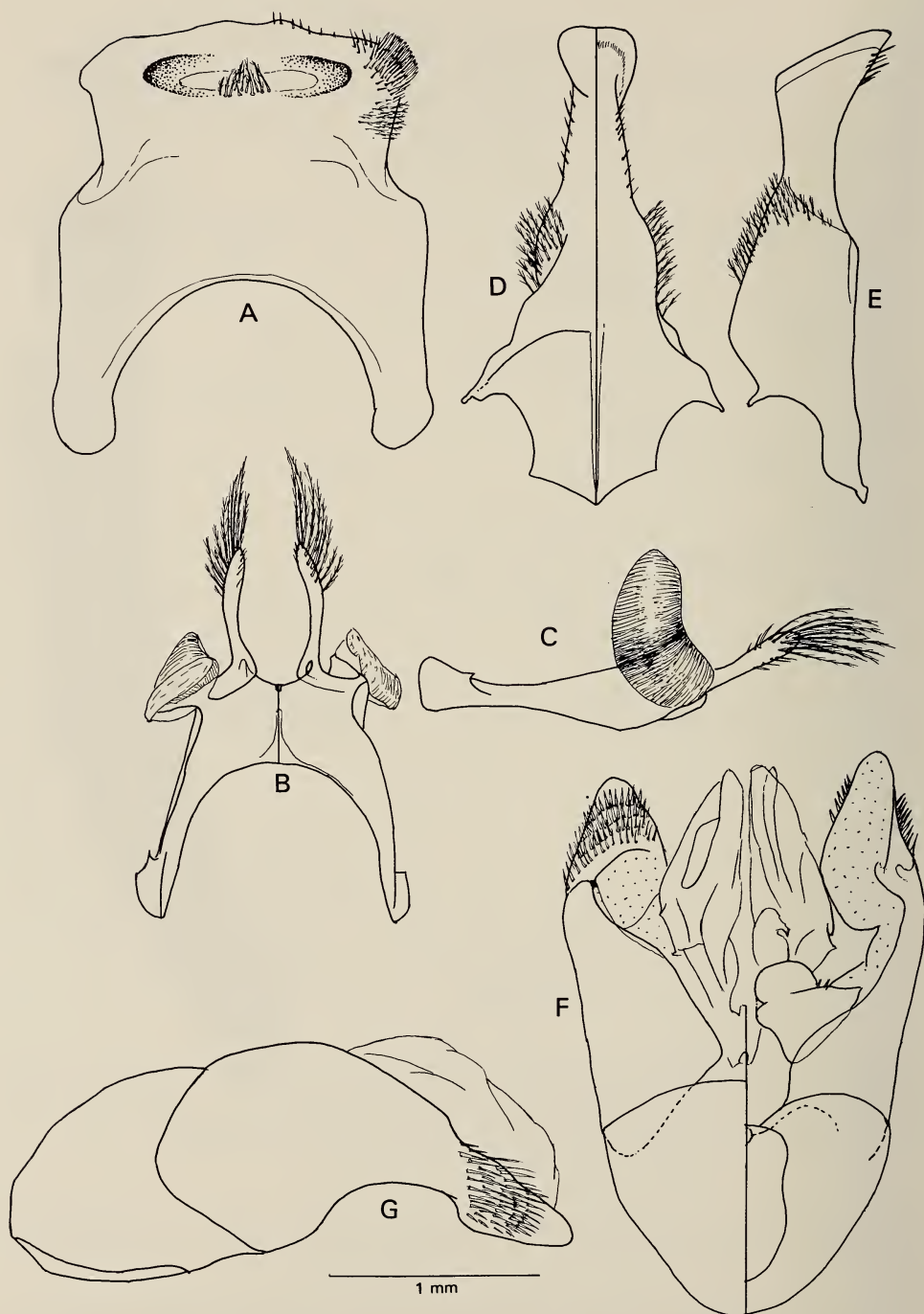


Fig. 37. *Rediviva micheneri* sp. nov. Male. A. Ventral aspect of S6. B. Dorsal and ventral view of S7. C. Lateral view of S7. D. Dorsal and ventral aspects of S8. E. Lateral view of S8. F. Dorsal and ventral view of genitalia. G. Genital capsule, lateral view.



half of prementum (Fig. 35A); maxilla with stipes slightly longer than cardo, galea with short fringe of hairs on apical third, galeal comb of 20 teeth (Fig. 35C–D); labrum broadly pointed 2.5 times as wide as long (55 : 22) (Fig. 35E); mandible with rounded subapical tooth (Fig. 33F). Mesosoma: median scutellar line narrow, not reaching middle of segment; front legs 1.3 to 1.5 times length of body, hind tibia narrower than basitarsus (26 : 30), basitarsus twice as long as wide (65 : 30), distal margin rounded, distal dorsal angle without scale (Fig. 36B).

*Sculpture.* Head: labrum with apical margin impunctate, disc coarsely punctured, less dense laterally, surface between punctures shiny, faintly coriaceous. Mesosoma: dense punctation on disc of scutum, distance between punctures less than their diameter, surface between punctures shiny; propodeal triangle small, well defined, surface wrinkled, rest of segment shiny, sparsely and finely punctured. Metasoma: T1 shiny with sparse fine punctures, T2–T4 densely and finely punctured.

*Vestiture.* Head: long light brown unbranched hairs on apical third of labrum, white plumose hairs on paraocular and frontal areas, sparser on clypeus and supraclypeal area, black along inner and outer eye margins. Mesosoma: white plumose hairs on scutum, scutellum, metanotum and propodeum, some black hairs on scutal margin; tibia and tarsus of all legs with light brown pubescence, oil-collecting hairs on apical quarter of basitarsus and on tarsomeres 2–5 of front legs (Fig. 36D), no oil-collecting hairs on tarsus of middle legs. Metasoma: T1 with sparse pale straw-coloured pubescence, T2–T4 with short decumbent similarly coloured hairs, slightly longer laterally, fimbriae on T5 light brown, darker on T6. No hair bands on apical margins of T2–T4.

### *Male*

*Measurements.* Allotype, body 12.0 mm, forewing 9.3 mm, malar space L : W 0.29. Other material (n = 7)—*Measurements and ranges:* body 11.4 mm (10.8–12.0 mm), forewing 8.9 mm (8.7–9.3 mm), malar space L : W 0.30 (0.29–0.31).

*Integumental colour.* Head, antennae, body, and legs black.

*Structure.* Anterior third of S6 concave, bottom of concavity shiny, faintly coriaceous, prominent median tuft of black branched hairs on proximal edge of concavity, median and lateral lobes poorly developed (Fig. 37A); S7 (Fig. 37B–C) with well-developed spatulate median lobes, long branched hairs on distal third, apical hairs two-thirds length of lobe; lateral lobes large, crescentic and strigate. S8 (Fig. 37D–E, 63H), ovate, longer than wide, anterior margin rounded, entire. Genital capsule (Fig. 37F–G), gonoforceps with short stout unbranched hairs on apical third.

*Sculpture.* Head: labrum impunctate basally, black, shiny; scattered punctures on anterior margin of clypeus, densely punctured on disc, some punctures coalescing towards base, area between punctures smooth, shiny. Mesosoma: fine widely spaced punctures on disc of scutum, area between punctures shiny. Propodeal triangle small, clearly defined, surface shiny, coriaceous, rest of propodeum shiny with fine scattered punctures.

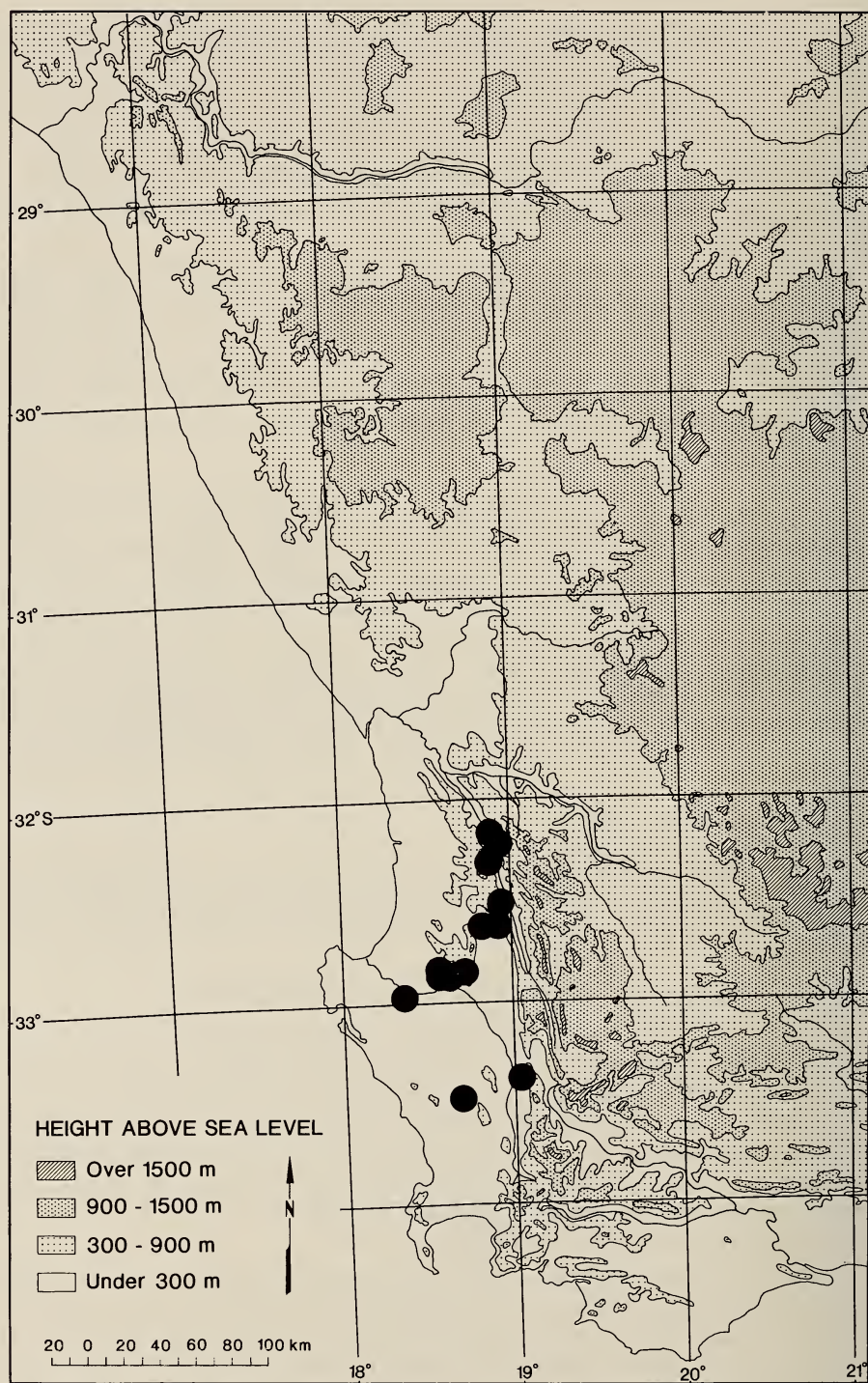


Fig. 38. Known distribution of *Rediviva micheneri* sp. nov.

*Vestiture.* Head: long silky white plumose hairs on anterior margin of clypeus and paraocular areas, shorter and sparser on disc of clypeus and supra-clypeal area. Mesosoma: shorter straw-coloured branched hairs on scutum, scutellum, metanotum and propodeum, some black hairs on disc of scutellum and propodeum. Metasoma: long white erect plumose hairs on T1–T4 (sometimes with black hairs on basal area of T5 and T4), black on T5 and T6, T7 brown to black.

#### *Host flower records*

*Rediviva micheneri* females collect oil from eight species of *Diascia*, the majority being taken on the long-spurred *D. longicornis* (59.5%) and *D. 'whiteheadii'* (9.9%). The remainder visited six species of medium- to short-spurred *Diascia*. These included *D. 'arenicola'* ssp. *'arenicola'*, *D. 'arenicola'* ssp. *'bulbosa'*, *D. capensis*, *D. 'speciosa'*, *D. 'grantiana'* and *D. elongata*. Females were seen to collect nectar from *Moraea fugax*, *M. miniata*, *Oxalis pes-caprae* and a *Dimorphotheca* species.

Of the seven males collected, four were taking nectar from *M. miniata* and three were patrolling *D. longicornis* in search of females.

#### *Distribution* (Fig. 38)

*Rediviva micheneri* is restricted to the south-western part of the Western Cape Province and most specimens were collected in the vicinity of the Piketberg Range (Hetkruis, Piketberg and Sauer) and in a municipal reserve on the southern outskirts of Malmesbury. Isolated specimens have been collected at Clanwilliam and Citrusdal in the Olifants River valley, at the Voëlville water purification works near Gouda, and in the sandveld fynbos near Hopefield.

Wheat is extensively cultivated in the area in which this species occurs and natural vegetation is restricted to reserves, patches of non-arable land and road verges. The major oil host plant, *D. longicornis*, occurs abundantly in fallow lands in the first year after the cultivation of wheat, but the most dense stands of *D. longicornis* and the short-spurred diascias visited by this species occur in the first year after accidental burns of natural vegetation.

### *Rediviva ruficornis* sp. nov.

Figs 1D, 39–41, 63D

#### *Diagnosis*

*Female.* Small- to medium-sized bees (10–13 mm), integument and pubescence black, flagellum reddish-brown. Forelegs not attenuate, equal length of body; front coxa with apical spine; dense oil-collecting hairs on front tarsomeres 2–4, finely divided hairs also present on tarsomere 5 but shorter and less dense. No oil-collecting hairs on tarsus of middle leg. No scale on distal dorsal angle of hind basitarsus. Spine on front coxa, separates this species from black forms of *R. parva*.

*Male.* Indistinguishable from males of *R. aurata*.



### *Etymology*

*Rufus* and *cornu*, Latin for red and a horn, referring to the reddish-brown antennal flagellum of females.

### *Material examined*

*Type material. Holotype:* SAM-HYM-B007549, female, Western Cape Province, Hopefield, farm Jantjiesfontein, 3218CD, V. B. Whitehead, 17 Sept. 1991. *Allotype:* SAM-HYM-B001148, male, Western Cape Province, Hopefield, farm Jantjiesfontein, 3218CD, V. B. Whitehead, 10 Sept. 1991. *Paratypes* (57 ♀♀, 4 ♂♂)—*Western Cape Province:* 2 ♀♀, Cape Town, Koeberg, farm Baasariesfontein, 3318DA, VBW, 25 Aug. 1994; 4 ♀♀, Elandsbaai, farm Skerpheuwel, 3318AD, KES, 28 Aug. 1987; 1 ♀, Elandsbaai, Leipoldtville road, 3218AD, VBW, 14 Sept. 1984; 2 ♀♀, 1 ♂, Elandsbaai, farm Skerpheuwel, 3218AD, VBW, 28 Aug. 1987; 1 ♀, Hopefield, farm Jantjiesfontein, 3218CD, KES, 12 Sept. 1991; 2 ♀♀, same locality, KES, 25 Sept. 1991; 1 ♀, same locality, KES, 2 Oct. 1991; 1 ♂, same locality, VBW, 10 Sept. 1991; 3 ♀♀, 1 ♂, same locality, VBW, 17 Sept. 1991; 7 ♀♀, same locality, VBW, 25 Sept. 1991; 2 ♀♀, Hopefield, farm Houmoed, 3218CD, VBW, 2 Oct. 1991; 3 ♀♀, Koperfontein, 3318AB, VBW, 19 Sept. 1986; 8 ♀♀, Paleisheuwel, farm Alexandershoek, 3218BC, KES, 11 Sept. 1991; 3 ♀♀, 1 ♂, same locality, KES, 12 Sept. 1991; 1 ♀, same locality, VBW, 12 Sept. 1991; 4 ♀♀, Sandberg Station, farm Droogerivier, 3218BC, KES, 8 Sept. 1987; 1 ♀, same locality, KES, 27 Aug. 1987; 2 ♀♀, same locality, VBW, 8 Aug. 1987; 6 ♀♀, same locality, VBW, 27 Aug. 1987; 2 ♀♀, same locality, VBW, 28 Sept. 1987; 2 ♀♀, Sauer, farm Suurfontein, 3218DC, VBW, 25 Aug. 1994.

### *Description*

#### *Female*

*Measurements. Holotype:* body 11.50 mm, forewing 8.3 mm, malar space L : W 0.22. *Other material* (n = 27)—*Measurements and ranges:* body 10.8 mm (9.7–12.5 mm), foreleg 11.2 mm (10.5–11.6 mm), Ft+bt 3.7 mm (3.5–3.8 mm), forewing 8.7 mm (8.3–9.0 mm). *Ratios:* FL : B 1.04 (0.98–1.12), malar space (n = 14) L : W 0.20 (0.15–0.22).

*Integumental colour.* Body black, anterior margin of clypeus, basal three-quarters of mandible, flagellum (except basal two-thirds of first segment), middle and hind femur, proximal part of tibia and distal part of femur of front leg dark reddish-brown. Brown coloration variable and may be absent on legs and clypeus of darker individuals.

*Structure.* Mouth-parts (Fig. 39A–E): glossa one-quarter length of prementum, labial palp extending to tip of glossa, paraglossa one-third length of glossa, ligular arms occupying basal two-thirds of prementum (Fig. 39A); cardo (Fig. 39B) slightly longer than stipes (85 : 75); galeal tip acutely pointed, comb of 17–19 teeth (Fig. 39C); labrum (Fig. 39D) more than twice as wide as long (52 : 21), distal margin evenly rounded. Mesosoma: mesoscutal line extending to middle of segment, terminating in small tubercle; forelegs not attenuate, equal to length of body, apical spine present on forecoxa (Fig. 40B); hind tibia as wide as basitarsus (26 : 27), hind basitarsus nearly three times as long as wide

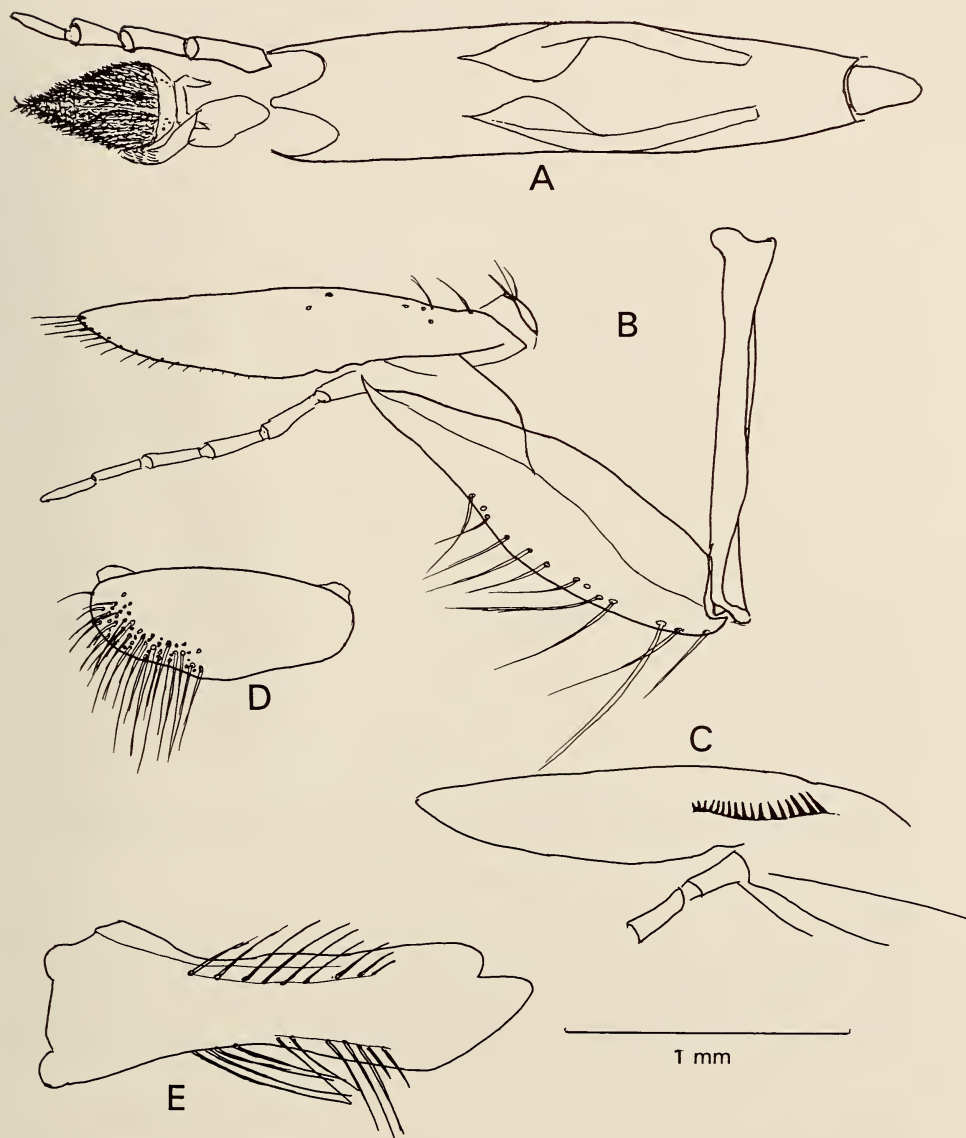


Fig. 39. *Rediviva ruficornis* sp. nov. Female. A. Labium, posterior view. B. Left maxilla. C. Inner view of galea to show comb. D. Labrum. E. Right mandible.

(62 : 27), without scale on distal dorsal angle, distal margin rounded, projecting beyond insertion of tarsomere 2 (Fig. 40A).

*Sculpture.* Clypeus with coarse punctures, approximately one diameter apart, area between punctures smooth and shiny; punctation on scutum fine becoming less dense on disc, area between punctures shiny; propodeal triangle with surface slightly wrinkled towards base, shiny, rest of segment shiny with larger wrinkles.

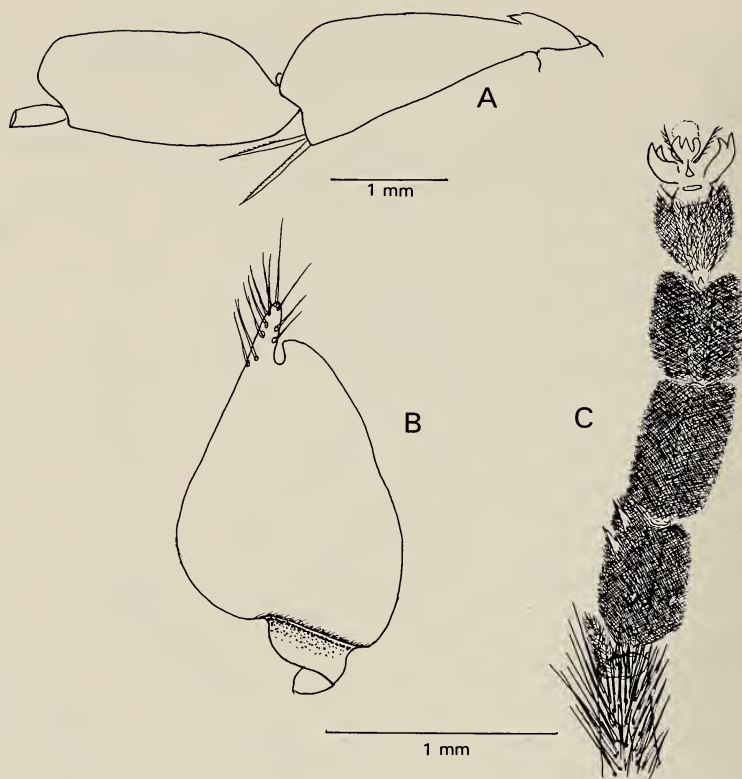


Fig. 40. *Rediviva ruficornis* sp. nov. Female. A. Tibia and basitarsus of hind leg. B. Left front coxa. C. Distal part of front basitarsus and tarsomeres 2-5.

**Vestiture.** Black except fimbriae on T5 and T6, hairs on distal margin of clypeus, apical margin of S4-S6 and tibia and tarsus of all legs, light brown. Finely divided oil-collecting hairs on tarsomeres 2-5 of forelegs, less dense and shorter on tarsomere 5, basitarsus with small patch of oil-collecting hairs distally (Fig. 40C). No oil-collecting hairs on tarsus of middle legs.

#### Male

**Measurements.** *Allotype*: male, body length 9.7 mm, forewing 7.7 mm. Only four males were collected in the area where females of this species were foraging. In size, body coloration, vestiture, genitalia and presence of a small pygideal plate, they are indistinguishable from males of *R. aurata*. Apical plate of S8 spade-shaped with crenulate distal margin (Fig. 63D) similar to *R. aurata*.

#### Host flower records

Females collect oil mainly from *Diascia* 'arenicola' and *D. capensis*, and to a lesser extent from *D. diffusa* and *Alonsoa unilabiata*. Nectar is obtained from *Moraea miniata*. Males patrol flowers of both *D. 'arenicola'* and *D. capensis* and take nectar from *Moraea miniata* and *Oxalis pes-caprae*.



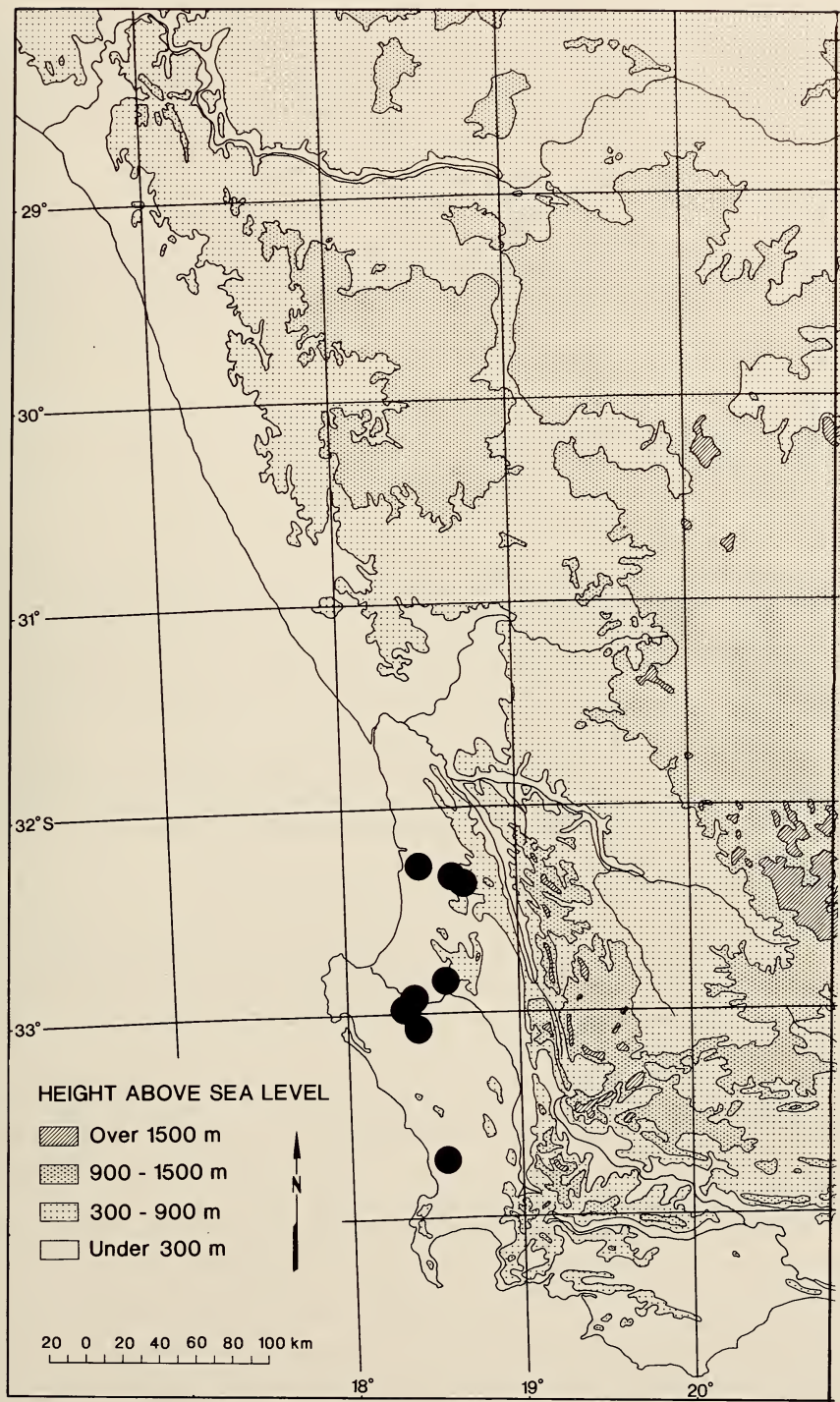


Fig. 41. Known distribution of *Rediviva ruficornis* sp. nov.

*Distribution* (Fig. 41)

This species has only been collected on the west coast of the Western Cape Province, from Paleisheuvel southwards to Piketberg, Hopefield and Koeberg Hill near Cape Town. It appears to be restricted to low-growing oil-bearing host plants on sandy substrates.

*Discussion*

*Rediviva ruficornis* and *R. aurata* females have many characters in common but can readily be separated by the black pubescence of *R. ruficornis*. They share some host plants but have never been collected on the same host plant at the same site as is the case with the two colour forms of *R. aurata* or the intergrading colour forms of *R. parva* females.

*Rediviva aurata* sp. nov.

Figs 1B, 42–45, 63C

*Diagnosis*

*Females*. Small- to medium-sized bees (9–12 mm). Head black, pubescence white except on clypeus where it is golden brown. Mesosoma: black, front coxa with hairy apical spine, oil-collecting hairs on tarsus of front leg only; hind basitarsus without scale on distal dorsal angle. Metasoma: terga entirely black or with varying amounts of light brown, pubescence light brown to golden, apical hair bands not pronounced.

*Males*. Small (9–10 mm). Body black, legs black except tibia of front and middle legs which have some light brown. Apical margin of terga with white hair bands, integument piceous to light brown; median vestigial pygideal plate on T7.

*Etymology*

*Auratus*, Latin for golden, refers to the light brown to golden hairs on the clypeus of females and light brown integument of the metasoma of most females from the type locality.

*Material examined*

*Type material*. *Holotype*: SAM-HYM-B007514, female, Western Cape Province, Piketberg, Groenvlei, 3218DD, V. B. Whitehead, 27 Aug. 1987. *Allotype*: SAM-HYM-B007515, male, Western Cape Province, Piketberg, Groenvlei, 3218DD, V. B. Whitehead, 27 Aug. 1987. *Paratypes* (42 ♀♀, 17 ♂♂)—*Western Cape Province*: 3 ♀♀, Darling, Waylands, 3318AD, KES, 8 Sept. 1989; 1 ♀, Darling, 3318AD, VBW, 18 Oct. 1986; 3 ♀♀, same locality, VBW, 19 Oct. 1986; 1 ♂, Hetkruis, Kromrivier, 3218DB, KES, 30 Aug. 1986; 5 ♀♀, 8 ♂♂, Hetkruis, Groenrivier, 3218DB, VBW, 22 Aug. 1988; 2 ♂♂, same locality, VBW, 25 Aug. 1994; 1 ♀, Langebaan, Postberg Reserve, 3318AA, KES, 14 Sept. 1988; 1 ♀, Langebaan, 3318AA, VBW, 20 Aug. 1986; 2 ♀♀, Malmesbury, road to municipal dump, 3318BC, KES, 16 Sept. 1987; 3 ♀♀, same locality, VBW, 16 Sept. 1987; 2 ♀♀, Piketberg, Banghoek, 3218DA,

KES, 20 Sept. 1991; 3 ♀♀, same locality, VBW, 20 Sept. 1991; 5 ♀♀, Piketberg, Groenvlei, 3218DD, KES, 27 Aug. 1987; 3 ♀♀, 1 ♂, same locality, VBW, 27 Aug. 1987; 1 ♂, same locality, VBW, 8 Oct. 1987; 2 ♀♀, 1 ♂, same locality, VBW, 22 Aug. 1988; 3 ♀♀, 3 ♂♂, Piketberg, Voorste Valley, 3218DC, K. S. Steiner, 5 Sept. 1987; 2 ♀♀, same locality, VBW, 19 Sept. 1987; 3 ♀♀, Saldanha, 3217BB, P. Goldblatt & J. Manning, 23 Aug. 1995. *Other material* (113 ♀♀)—*Western Cape Province*: 2 ♀♀, Darling, 3318AD; 30 ♀♀, Hetkruis, 3218DB; 23 ♀♀, Malmesbury, 3318BC; 9 ♀♀, Piketberg, Banghoek, 3218DA; 17 ♀♀, Piketberg, Groenvlei, 3318DD; 2 ♀♀, Piketberg, Moutonspad, 3218DA; 30 ♀♀, Piketberg, Voorste Valley, 3218DC.

### *Description*

#### *Female*

*Measurements*. *Holotype*: body 10.7 mm, forewing 8.5 mm, malar space L : W 0.19. *Other material* (n = 30)—*Measurements and ranges*: body 10.6 mm (9.5–11.8 mm), forewing 8.7 mm (8.3–9.3 mm), foreleg 10.7 mm (9.8–11.5 mm), Ft+bt 3.4 mm (3.2–3.6 mm). *Ratios*: FL : B 1.03 (0.98–1.06), malar space (n = 10) L : W 0.23 (0.21–0.31).

*Integumental colour*. Head black, antennal scape, pedicellus and basal three-quarters of first flagellar segment black, rest of flagellum reddish-brown. Mesosoma black, legs dark brown to black. Metasoma with at least basal two-thirds of T1 black, other terga with varying amounts of black and light brown.

*Structure*. Mouth-parts (Fig. 42A–H): Glossa one-quarter length of prementum, labial palp extending slightly beyond tip of glossa, paraglossa one-third length of glossa; ligular process occupying basal half of prementum (Fig. 42A). Cardo slightly shorter than stipes, galea slightly longer than stipes, apex narrowly rounded, galeal comb of 17 teeth (Fig. 42E–F). Labrum evenly convex apically, 1.5 times as wide as long (Fig. 42G). Foreleg equal to length of body, forecoxa with inner margin extended into a stout spine (Fig. 43D). Hind basitarsus two-fifths as wide as long (26 : 61), slightly narrower than tibia (26 : 27), apex rounded without scale on distal dorsal angle (Fig. 43B).

*Sculpture*. Head: clypeus with large widely spaced punctures, area between punctures shiny, punctuation finer and denser on supraclypeal area. Mesosoma: mesoscutal line distinct, slightly raised, extending to middle of segment terminating in small tubercle; punctures on scutal disc fine, area between coriaceous, inter-punctal distance greater than diameter of punctures; propodeal triangle small, shiny, minutely wrinkled, rest of propodeum shiny with well-spaced longitudinal wrinkles.

*Vestiture*. Head: hairs on labrum, clypeus and supraclypeal area sparsely branched, light brown to golden; white and densely plumose on paraocular area and frons. Mesosoma: episternum covered with long white pubescence; legs with shorter white hairs becoming light brown on tibia and tarsus; mixture of shorter white and black hairs on scutum, longer and straw-coloured on scutellum, metanotum and propodeum; dense finely divided oil-collecting hairs on tarsomeres 2–4 of foreleg, no flat scraper-like hairs visible, pubescence less dense on tarsomere 5; some finely divided oil-collecting hairs on distal part of front basitarsus (Fig. 43E); no oil-collecting hairs on tarsomeres of middle leg.



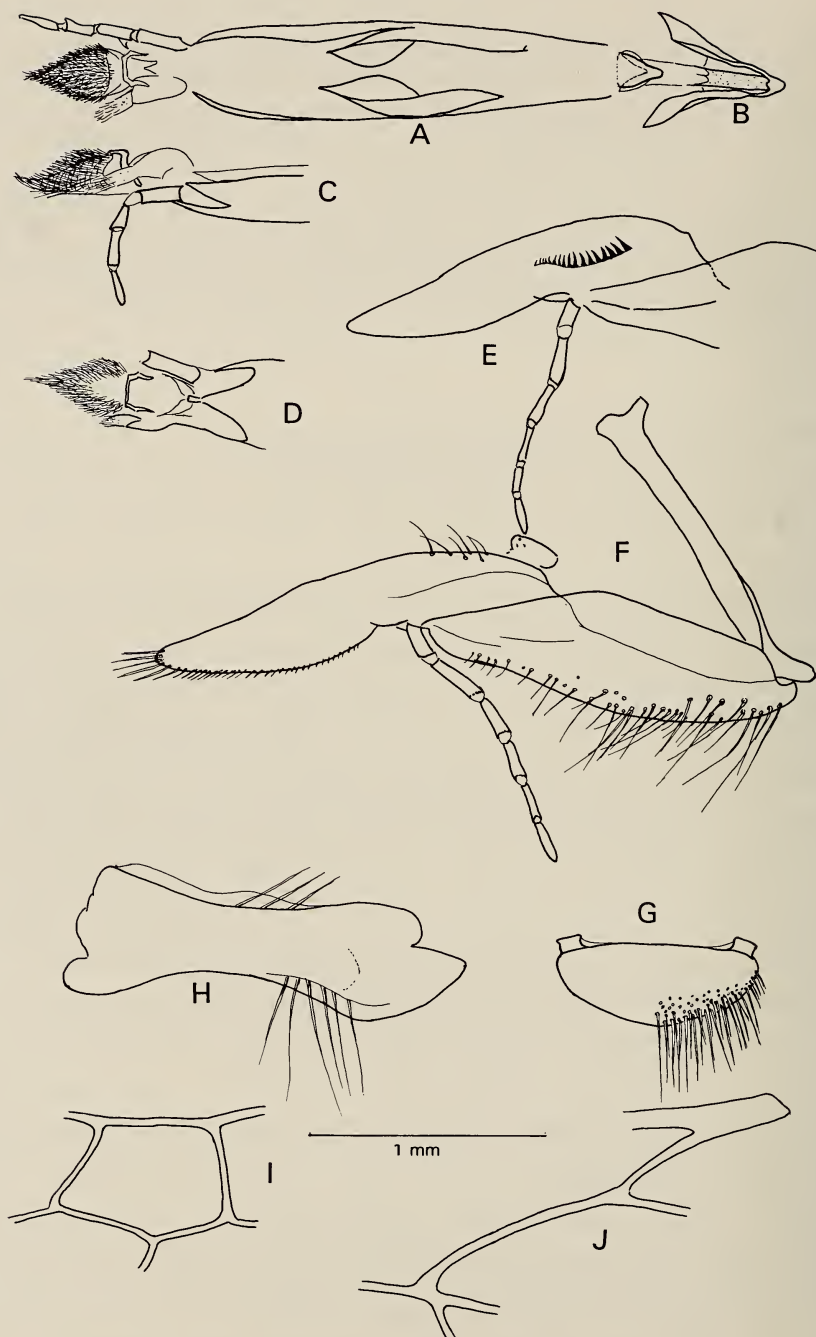


Fig. 42. *Rediviva aurata* sp. nov. Female. A. Labium, anterior view. B. Base of labium with associated sclerites, posterior view. C. Lateral view of distal part of labium. D. Posterior view of distal part of labium. E. Galea to show comb. F. Left maxilla. G. Labrum. H. Right mandible. I. Second submarginal cell of right wing. J. Basal vein and first abscissa of Rs of right front wing.

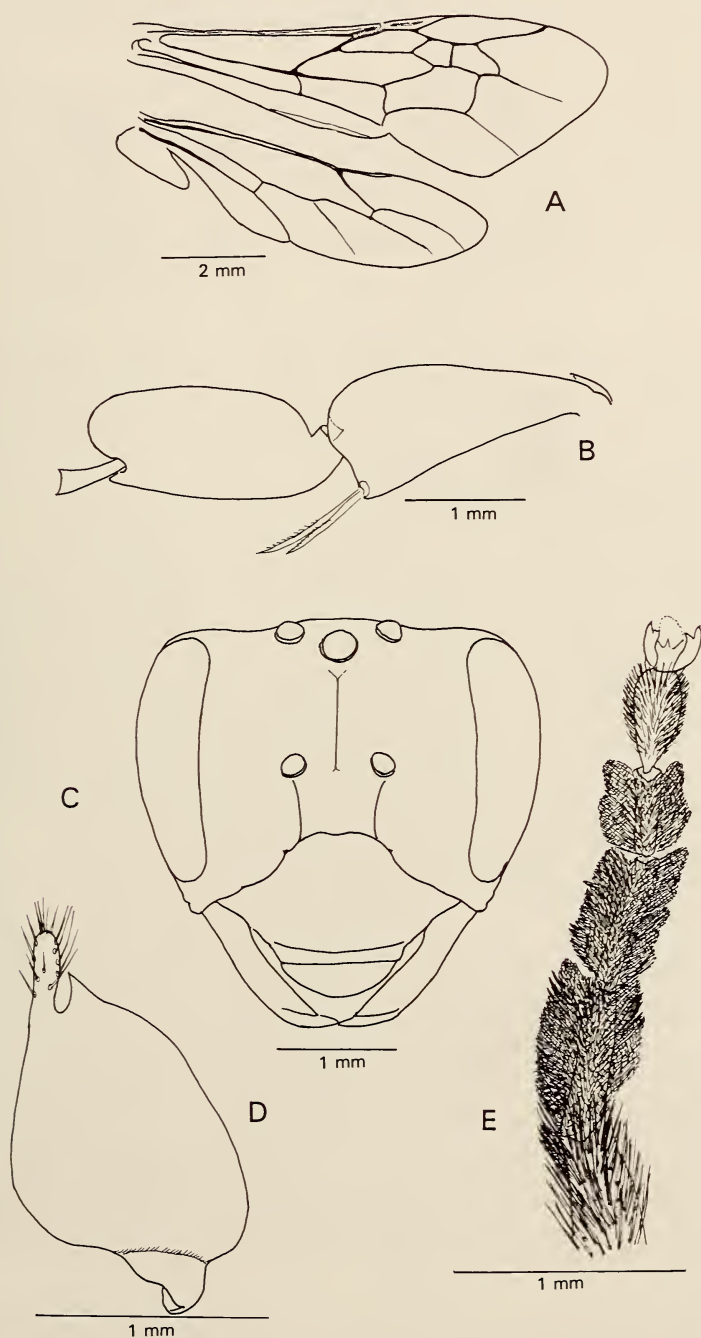


Fig. 43. *Rediviva aurata* sp. nov. Female. A. Right wings. B. Tibia and basitarsus of hind leg. C. Head, anterior aspect. D. Left front coxa. E. Distal part of front basitarsus plus tarsomeres 2-5.

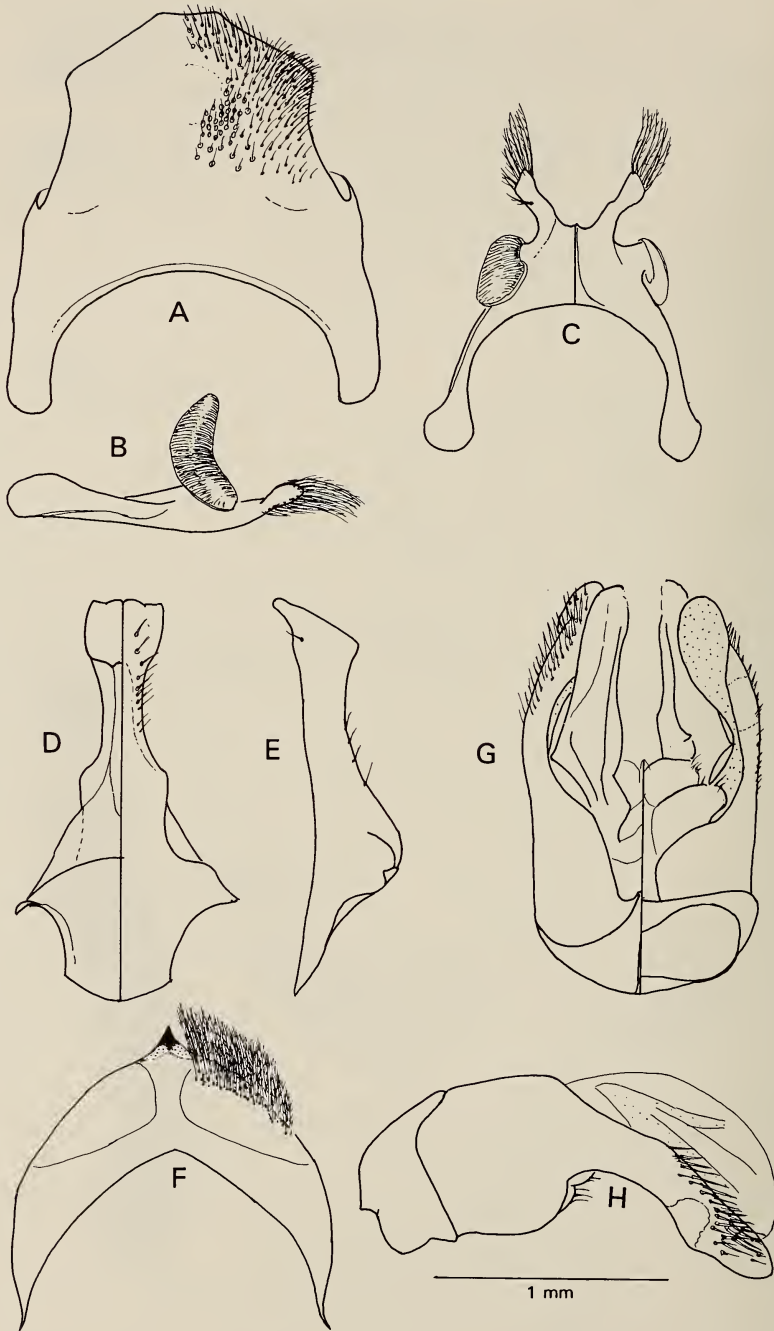


Fig. 44. *Rediviva aurata* sp. nov. Male. A. S6, ventral view. B. S7, lateral view. C. Dorsal and ventral views of S7. D. Dorsal and ventral views of S8. E. S8, lateral aspect. F. Tergum 7 with vestige of a pygideal plate. G. Genital capsule dorsal and ventral view. H. Genital capsule lateral view.



Metasoma: no distinct hair bands on apical margins of terga; white sub-erect hairs on T1, short decumbent yellow hairs on T2–T4, fimbriae on T5 longer, light brown.

*Colour variation.* There is some variation in colour of the integument of the metasoma of females, from completely black to varying amounts of light brown. There is also a difference in the number of individuals with light brown on the metasoma among the various collection areas. At Het Kruis 86 per cent ( $n = 36$ ) and at Malmesbury 17 per cent ( $n = 36$ ) of females collected had light brown on the metasoma. At all other sites the integument of the metasoma of females was entirely black.

### Male

*Measurements.* Allotype: male, body 9.7 mm, forewing 7.5 mm, malar space L : W 0.17. Other material ( $n = 10$ )—*Measurements and ranges:* body 9.5 mm (9.2–10.2 mm), foreleg 7.8 mm (7.5–8.0 mm), forewing 8.0 mm (7.5–8.3 mm). *Ratios:* FL : B 0.82, malar space L : W 0.20 (0.16–0.23).

*Integumental colour.* Head: antenna black, dark brown on underside of proximal flagellomeres. Mesosoma: coxa, trochanter and femur of legs black, tibia of front and middle legs with variable areas of black and light brown, tarsus of front and middle legs, tibia and tarsus of hind leg light brown. Metasoma: apical margins of T1–T5 piceous to light brown.

*Structure.* Forelegs shorter than body. Metasoma: S6 having poorly distinguishable median and lateral lobes (Fig. 44A); median lobes well developed on S7, terminating obliquely with strong branched hairs equal to length of lobe; well-developed membraneous lateral lobes with distinct transverse striations (Fig. 44B–C); S8 with apical plate spade-shaped, lateral margins diverging distally, apical margin crenulate (Fig. 44D–E, 63C); gonoforceps slightly shorter than penis valve, with strong unbranched hairs on distal half, small translucent area two-thirds distance from base (Fig. 44G–H). Rudimentary genital plate present in form of small reddish-brown sclerotized median ridge on apical margin of T7 (Fig. 44F).

*Sculpture.* Clypeus strongly punctured anteriorly, finer basally, surface between punctures shiny; median mesoscutal line terminating in small tubercle; fine widely spaced punctures on disc of scutum, area between punctures shiny.

*Vestiture.* Head: labrum with light brown hair on apical margin; clypeus, supraclypeal and paraocular area and scape with long white plumose hairs; black branched hairs on ocular margin. Mesosoma: short black branched hairs on disc of scutum, white plumose hairs on episternum, propodeum and margin of scutum. Metasoma: long white erect plumose hairs on T1, T2 with erect black hairs on basal part of disc, area of black hairs increasing progressively to T3–T5, decumbent white hair bands on apical margin of T2–T5.

### Host flower records

*Rediviva aurata* females collect oil from several prostrate *Diascia* species that include *D. elongata*, *D. 'speciosa'*, *D. 'grantiana'*, *Diascia 'arenicola'* ssp. '*bulbosa*', *D. diffusa* and *D. capensis*. They have been observed taking nectar from *Oxalis pes-caprae* and *Moraea miniata*.

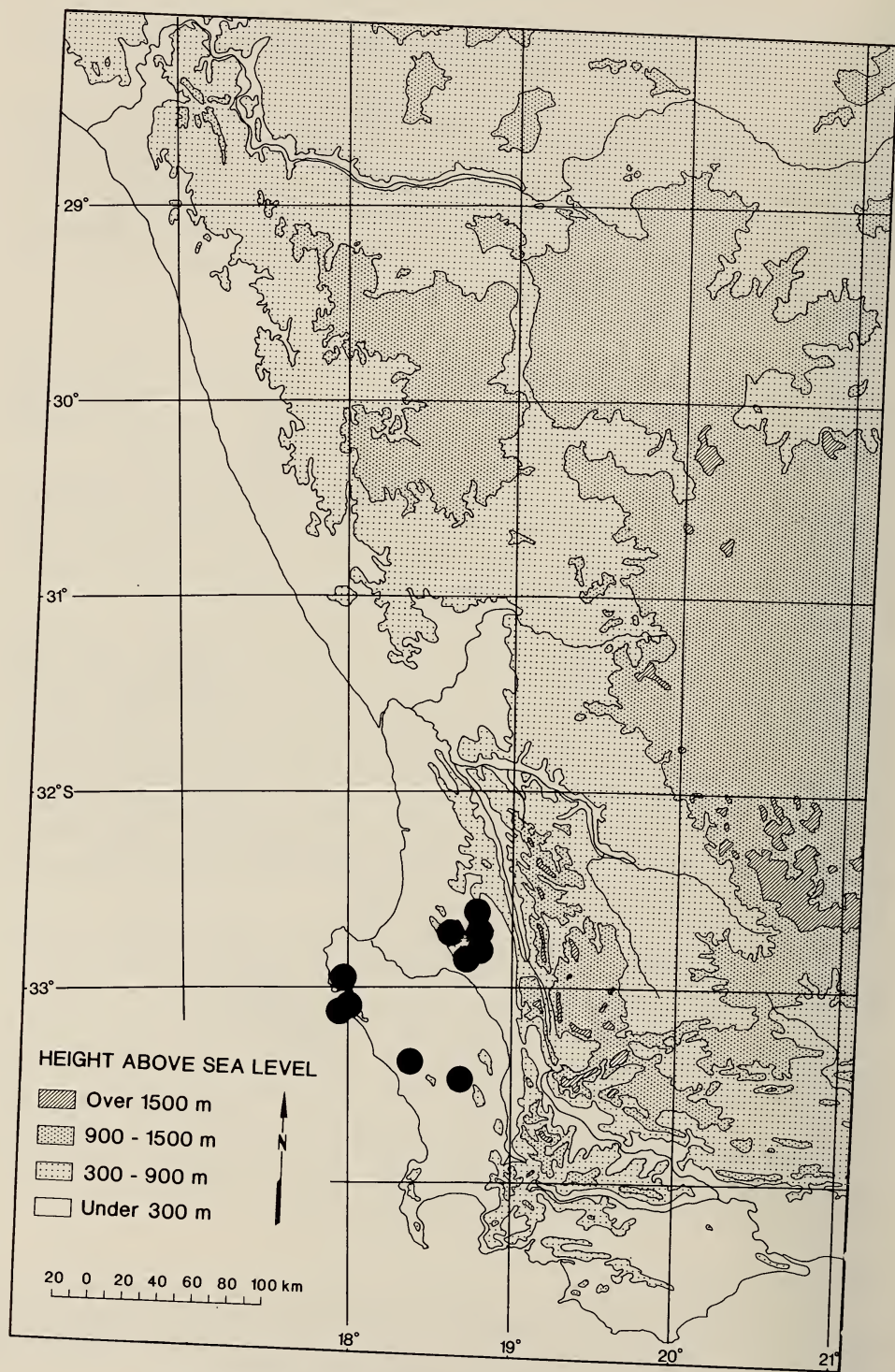


Fig. 45. Known distribution of *Rediviva aurata* sp. nov.

Males patrol the oil host plants in search of receptive females and also collect nectar from *Oxalis pes-caprae* and *Moraea miniata*.

#### *Distribution* (Fig. 45)

On the coast this species has been collected from Elandsbaai south to Saldanha Bay, and inland from Het Kruis to Piketberg and south to Malmesbury.

#### *Rediviva peringueyi* (Friese, 1911)

Figs 2C, 46–49, 64B

*Andrena* (*Rediviva*) *peringueyi* Friese, 1911: 671.

*Rediviva peringueyi* (Friese) Cockerell, 1931: 402.

*Rediviva peringueyi* (Friese) Michener, 1981: 123.

#### *Diagnosis*

*Females.* Body medium-sized, 11.0–13.2 mm, integument black. Head: clypeus coarsely punctured, surface between punctures shiny but faintly coriaceous. Mesosoma: punctures on scutum finer than on clypeus, less than one diameter apart, surface between punctures granular; forelegs not much elongated, slightly shorter than body, oil-collecting hairs on tarsomeres 2–5, no oil collecting hairs on tarsus of middle leg; basitarsus of hind leg without scale on distal dorsal angle. Metasoma: light brown to rufous pile, apical hair bands on T2–T4 of similar colour, fimbriae of T5–T6 slightly darker.

*Males.* Body medium-sized, 10.2–11.7 mm, integument black. Head: punctuation and surface of clypeus similar to female. Metasoma: light brown to rufous apical hair bands on T1–T5, fimbriae of similar colour. S6 distal margin shallowly emarginate, S7 with prominent spatulate median lobes and large translucent strigate lateral lobes, gonoforceps with strong unbranched hairs on distal two-thirds.

#### *Etymology*

Named for Louis Albert Péringuey, self-taught naturalist, who laid the foundation for the classification of South African Coleoptera and subsequently became Director of the South African Museum from 1906 to 1924.

#### *Material examined*

*Type material.* *Lectotype:* Female, Paarl, 3318DB, R. M. L. (= R. L. Lightfoot), Oct. 1888. (Museum für Naturkunde, Humboldt-Universität, Berlin). *Paralectotype:* SAM-HYM-B002684, Female, Stellenbosch, 3318DD, R. M. L., (= R. M. Lightfoot), Oct. 1888 (South African Museum, Cape Town). *Other material* (130 ♀♀, 35 ♂♂)—*Western Cape Province:* 2 ♀♀, Bellville, Tygerberg Reserve, 3318DC, VBW, 19 Oct. 1990; 1 ♂, Cape Town, 3318CD (no date or collector); 1 ♀, Cape Town, Koeberg Hill, Baasarriesfontein, 3318DA, KES, 19 Sept. 1994; 1 ♀, Cape Town, Koeberg Hill, 3318DA, VBW, 21 Sept. 1996; 3 ♀♀, 1 ♂, Citrusdal, Grey's Pass, 3218DB,



KES, 9 Sept. 1989; 2 ♀♀, Darling, 3318AD, KES, 17 Sept. 1986; 4 ♀♀, Darling, farm Contraberg, 3318AD, KES, 26 Sept. 1989; 1 ♀, Darling, farm Slangkop, 3318AD, KES, 18 Sept. 1986; 2 ♀♀, Darling, farm Waylands, 3318AD, KES, 8 Sept. 1989; 1 ♀, Hetkruis, farm Groenrivier, 3218DB, VBW, 14 Aug. 1981; 1 ♂, same locality, VBW, 23 Aug. 1991; 4 ♀♀, Langebaan, Postberg Reserve, 3318AA, KES, 14 Sept. 1986; 2 ♀♀, same locality, KES, 14 Sept. 1988; 1 ♀, same locality, KES, 8 Sept. 1989; 4 ♀♀, same locality, KES, 5 Sept. 1990; 10 ♀♀, same locality, VBW, 17 Sept. 1988; 5 ♀♀, same locality, VBW, 21 Sept. 1988; 9 ♀♀, Malmesbury commonage, KES, 14 Sept. 1994; 6 ♀♀, same locality, KES, 12 Sept. 1994; 1 ♀, same locality, VBW, 16 Sept. 1987; 2 ♀♀, same locality, VBW, 25 Sept. 1987; 1 ♀, same locality, VBW, 26 Sept. 1987; 6 ♀♀, same locality, VBW, 14 Sept. 1994; 3 ♀♀, same locality, VBW, 14 Sept. 1995; 6 ♀♀, same locality, VBW, 20 Sept. 1995; 1 ♀, Moorroesburg, 3118BA, VBW, 9 Sept. 1994; 1 ♀, Paleisheuvel, Berg Valey, 3218BC, VBW, 12 Sept. 1981; 1 ♀, Piketberg, farm Dezehoek, 3218DC, KES, 13 Sept. 1984; 2 ♀♀, same locality, KES, 5 Sept. 1987; 1 ♀, Piketberg, Karoo-kop, 3218DA, VBW, 17 Sept. 1985; 2 ♀♀, Piketberg, Versveld Pass, 3218DC, VBW, 22 Sept. 1994; 1 ♀, Porterville, farm Kleinberggrivier, 3318BB, KES, 17 Sept. 1987; 2 ♀♀, Riebeek-Kasteel, 3318BD, KES, 17 Sept. 1987; 1 ♂, Stellenbosch, 3318DD, H. Brauns, Sept. 1926; 2 ♂♂, Stellenbosch, 3318DD, A. Gagiano, 16 Sept. 1945; 11 ♀♀, Stellenbosch, farm Joostenbergkloof, 3318DD, KES, 16 Sept. 1987; 20 ♀♀, same locality, VBW, 16 Sept. 1987; 1 ♀, same locality, VBW, 25 Sept. 1987; 9 ♂♂, same locality, VBW, 18 Aug. 1988; 6 ♂♂, same locality, VBW, 16 Aug. 1988; 2 ♀♀, 1 ♂, same locality, VBW, 28 Aug. 1988; 1 ♀, same locality, VBW, 22 Sept. 1988; 4 ♀♀, same locality, VBW, 7 Oct. 1988; 2 ♀♀, Swellendam, Bontebok National Park, 3420AB, VBW, 30 Sept. 1987; 2 ♂♂, Worcester, Karoo Gardens, 3119CB, KES, 18 Aug. 1989.

### *Description*

#### *Female*

*Measurements.* *Lectotype*: body 13.2 mm, forewing 10.3 mm, malar space L : W 0.21. *Paralectotype*: body 12.0 mm, forewing 10.2 mm, malar space L : W 0.25. *Other material* (n = 20)—*Measurements and ranges*: body 12.0 mm (10.0–12.5 mm), foreleg 11.2 mm (10.5–12.6 mm), forewing 9.8 mm (8.5–10.8 mm), Bt+ft 3.8 mm (3.7–3.9 mm). *Ratios*: FL : B 0.94 (0.88–1.01), malar space (n = 15) L : W 0.21 (0.17–0.23).

*Integumental colour.* Head black, antenna black, dark brown underneath. Mesosoma black, wings dusky, veins black to dark brown, legs mainly black, tarsi reddish-brown. Metasoma black.

*Structure.* Head: wider than long (12.7 : 10) (Fig. 47C); mouth-parts (Fig. 46A–F): glossa short subtriangular, one-quarter length of prementum, not extending beyond labial palps; paraglossae slightly longer than suspensorium, reaching basal third of glossa; ligular arms occupying basal half of prementum (Fig. 46A); cardo slightly shorter than stipes, three and a half times longer than wide, lower margin with long branched hairs; maxillary palp extending beyond tip of galea (Fig. 46D), galeal comb of 15 teeth (Fig. 46C); labrum (Fig. 46E)

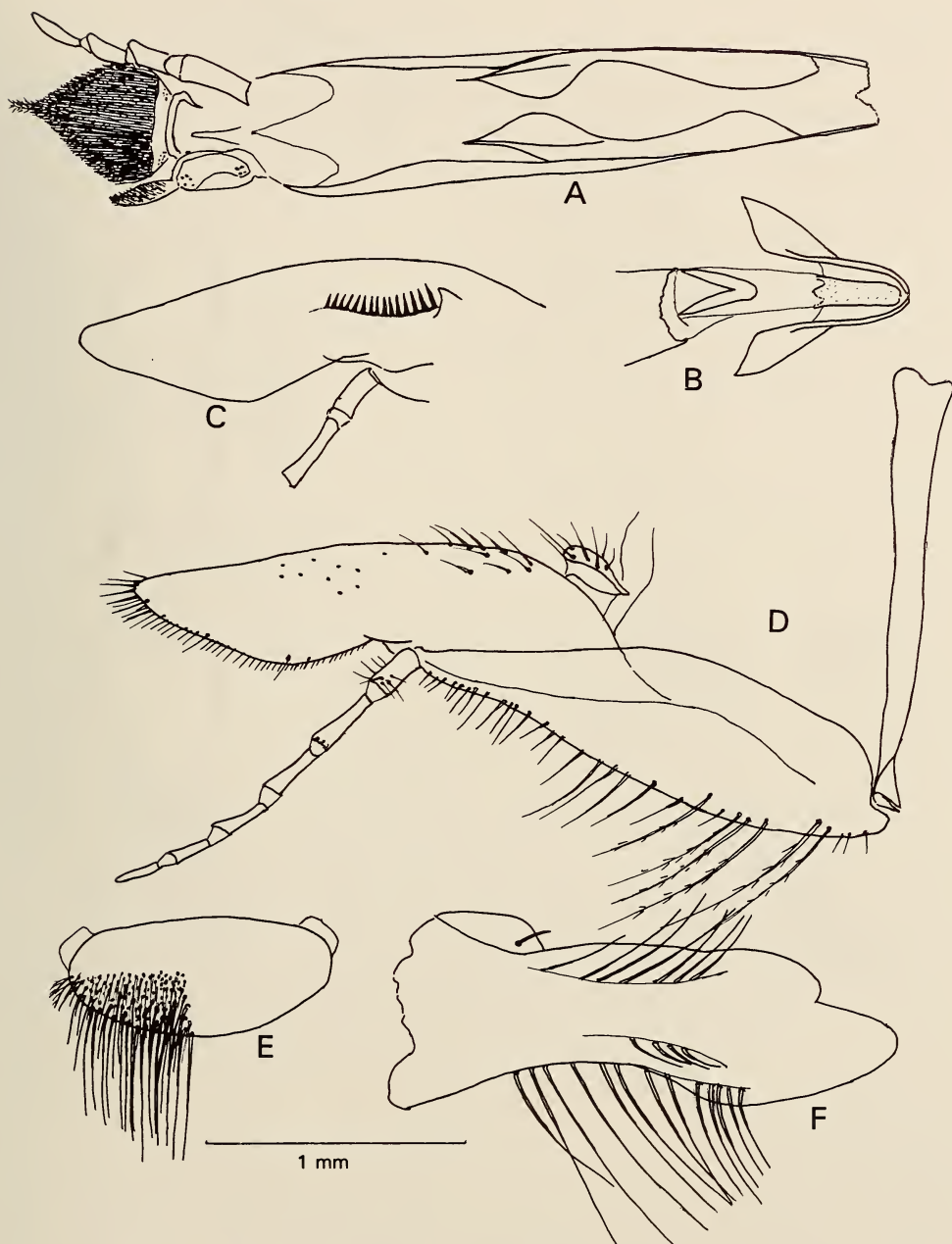


Fig. 46. *Rediviva peringueyi* (Fries, 1911). Female. A. Labium, anterior view. B. Base of prementum, mentum and lorum, posterior view. C. Inner view of galea to show comb. D. Left maxilla. E. Labrum. F. Right mandible.

twice as wide as long, anterior margin evenly convex. Mesosoma: wings dusky; front legs slightly shorter than body, hind legs with tibia nearly as wide as

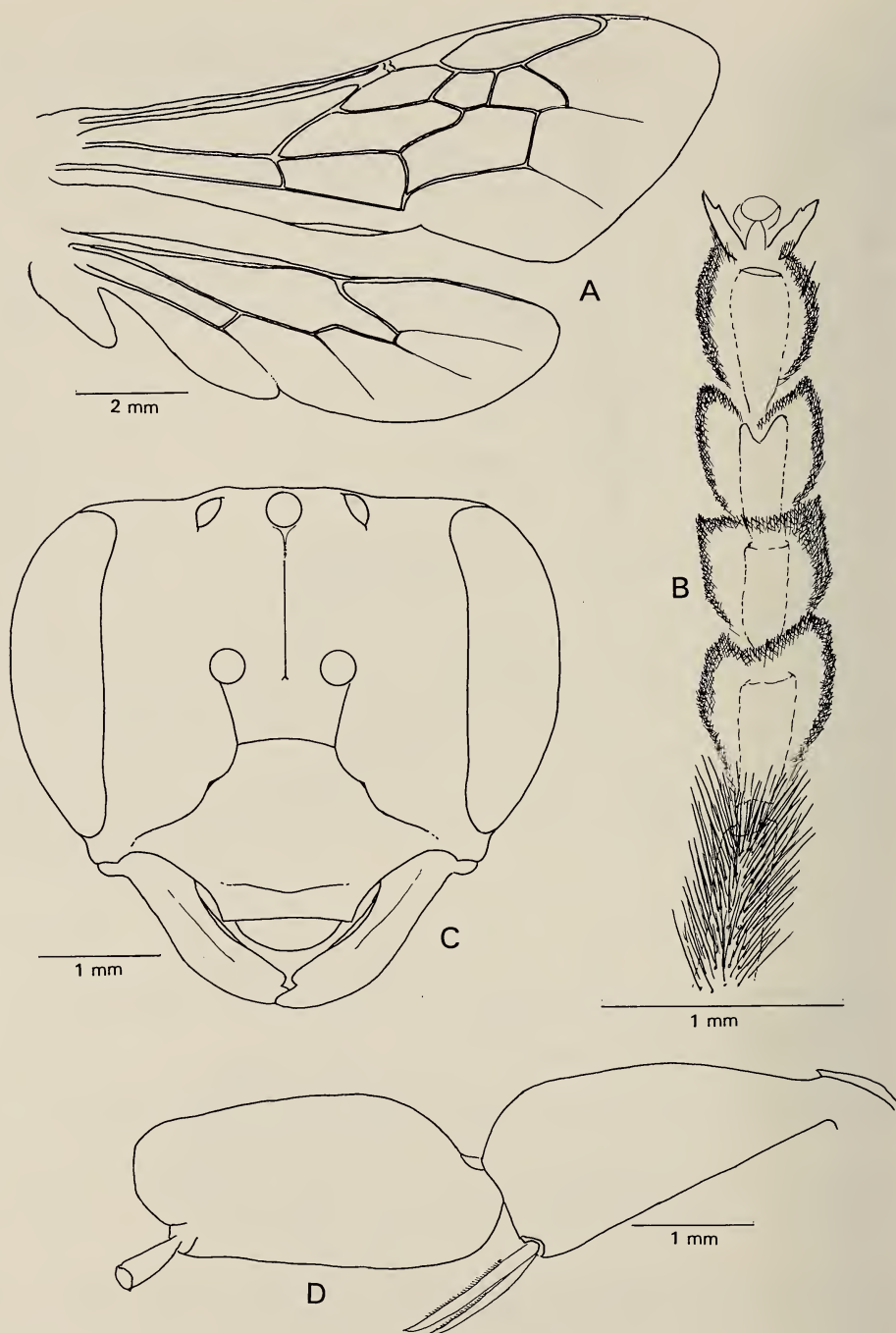


Fig. 47. *Rediviva peringueyi* (Fries, 1911). Female. A. Right wings. B. Distal portion of front basitarsus plus tarsomeres 2-5. C. Head, anterior view. D. Hind tibia and basitarsus.



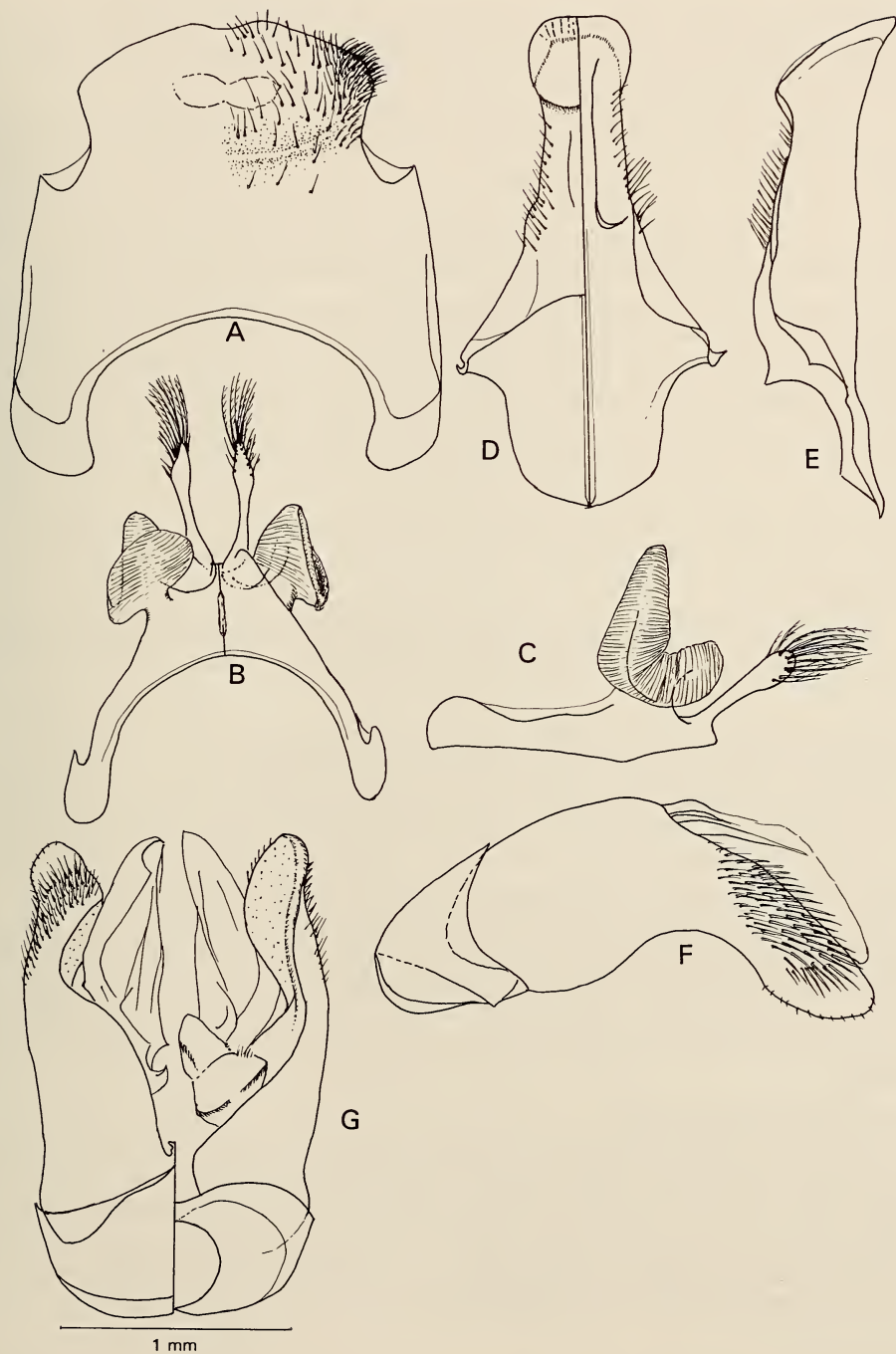


Fig. 48. *Rediviva peringueyi* (Friese, 1911). Male. A. S6, ventral view. B. S7, dorsal and ventral view. C. S7, lateral aspect. D. Dorsal and ventral view of S8. E. Lateral view of S8. F. Lateral view of genital capsule. G. Dorsal and ventral view of genitalia.

basitarsus (37 : 40), basitarsus more than twice as long as wide (85 : 40), distal margin rounded, extending beyond insertion of tarsomere 2, no scale-like projection on distal dorsal angle (Fig. 47D).

*Sculpture.* Head: labrum basal third impunctate, shiny; clypeus with distinct preapical ridge, distal margin largely impunctate, rest of clypeus with coarse punctures, less than one diameter apart on disc, surface between punctures shiny, coriaceous. Mesosoma: scutum with scattered punctures, area between coarsely roughened; propodeal triangle small, surface strigate, rest of propodeum with scattered punctures, surface between punctures coriaceous.

*Vestiture.* Head: labrum with long light brown unbranched hairs on apical two-thirds, clypeus light brown unbranched hairs on disc, plumose and paler laterally, vestiture on paraocular areas pale straw-coloured. Mesosoma: scutum and scutellum with short black branched pilosity on disc mixed with finer pale straw-coloured hairs on margins, metanotum with longer plumose hairs. Coxa, trochanter and femur clothed in short straw-coloured hairs, dark brown on tibia and tarsus; oil-collecting hairs on tarsomeres 2–5 of front legs (Fig. 47B). Metasoma: light brown hair band on apical margin of T1–T4, longer dark brown fimbriae on T5–T6.

#### *Male*

*Measurements and ranges* ( $n = 10$ ). Body 11.2 mm (10.2–11.7 mm), forewing 9.1 mm (8.5–9.2 mm), foreleg 8.7 mm (8.3–9.0 mm). FL : B 0.79 (0.75–0.81), malar space L : W 0.22 (0.21–0.24).

*Integumental colour.* Head, mesosoma and metasoma black, front and middle tarsi, hind tibia and tarsus piceous to dark brown.

*Structure.* Head: malar space length one-fifth of width. Mesosoma: forelegs not attenuate, four-fifths length of body; hind tibia one and a half times breadth of basitarsus. Metasoma: S6 with poorly developed median lobes (Fig. 48A), distal margin shallowly emarginate, lateral lobes indicated by dense patch of strong bristles; S7 (Fig. 48B–C) with club-shaped median lobes, long plumose hairs distally, terminal hairs slightly shorter than lobe; large strigate translucent lateral lobes; S8 (Figs 48D–E, 64B) with apical plate ovate, concave, length one and a half times width, distal margin evenly rounded; genitalia (Fig. 48F–G): gonoforceps with stout unbranched hairs on distal half, not reaching apical margin.

*Sculpture.* As in female.

*Vestiture.* Head: long white branched hairs on clypeus, paraocular areas, frons and scape, erect black hairs on inner margins of eyes and distally on scape. Mesosoma: scutum, scutellum and metanotum with brown plumose pubescence, some scattered black hairs on disc; propodeum and epipleural areas covered in longer white pilosity. Metasoma: reddish-brown apical hair bands on T1–T5, fimbriae on T6 and T7 light brown.

#### *Variations*

Malar space measurements, length and width, were made on females from six localities and the ratios L : W were fairly uniform for five of these (Stellenbosch, Malmesbury, Piketberg, Darling and Swellendam) with a mean

of  $L : W = 0.22$  and a range of 0.17–0.23. However, the Postberg sample from the West Coast National Park had a longer malar space with a mean of  $L : W$  0.29 and a range of 0.25–0.32. In all other respects females from the six localities were similar. The Postberg reserve is on a peninsula where it is largely surrounded by water and this partial isolation may account for this divergence.

*Note on the status of the type specimens of Rediviva peringueyi*

*Rediviva* is based on two females of *R. peringueyi* collected in October 1888 by R. M. Lightfoot, a member of the scientific staff at the South African Museum at the time. These were sent to Friese in Berlin who retained the specimen from Paarl, and returned the other, collected at Stellenbosch. In his description Friese did not designate a holotype. However, Michener (1981) stated that 'one of Friese's original female specimens from Stellenbosch . . . is in the South African Museum' and the 'female type from Paarl' is deposited in Berlin.

There is a 'Type' label on pink card attached to the Paarl specimen, presumably by Michener. As Friese did not designate a type in his 1911 paper, we have labelled this specimen, deposited in the Humboldt University Museum, Berlin, as the *lectotype* and the Stellenbosch female (deposited in the South African Museum, Cape Town) as the *paralectotype*.

*Host flower records*

Of the 106 females collected on oil-producing plants, the majority (50.5%) were on *Hemimeris*, mainly *H. racemosa*, but four specimens were also taken on *H. sabulosa*. Five species of *Diascia* were also visited for oil; these include *D. 'grantiana'* (18.7%), *D. 'pusilla'* (4.7%), *D. elongata*, *D. capensis* and *D. 'arenicola'* (3.7%).

*Rediviva peringueyi* is one of the five species of *Rediviva* that collects oil from terrestrial orchids in the winter rainfall area. Twenty four per cent of our female specimens were collected visiting the orchids *Pterygodium alatum*, *P. caffrum*, *P. catholicum*, *P. hallii*, *P. inversum*, *P. volucris*, and *Corycium orobanchoides*.

Of the 35 males in our collection, 24 were collected in the vicinity of oil host plants, 23 patrolling *H. racemosa* and one *P. alatum*.

Females visited 11 species of nectar plants, with 45.9 per cent being collected on *Moraea* (*M. fugax*, *M. gawleri*, *M. miniata* and two *Moraea* sp.) and a further 25 per cent on *Stachys aethiopica*. The remaining material was taken on *Chironia decumbens*, *Cyphia* sp., *Heliophila coronopifolia*, *Oxalis* sp., and *Raphanus raphanistrum*.

Only eight males were collected taking nectar and of these, six were on species of *Moraea* and the remainder on *Chironia*.

*Distribution* (Fig. 49)

*Rediviva peringueyi* is restricted to the extreme south-western corner of the Western Cape Province, largely in areas below 300 m. Here there are several species of oil-producing terrestrial orchids from which it obtains oil. *Hemimeris*



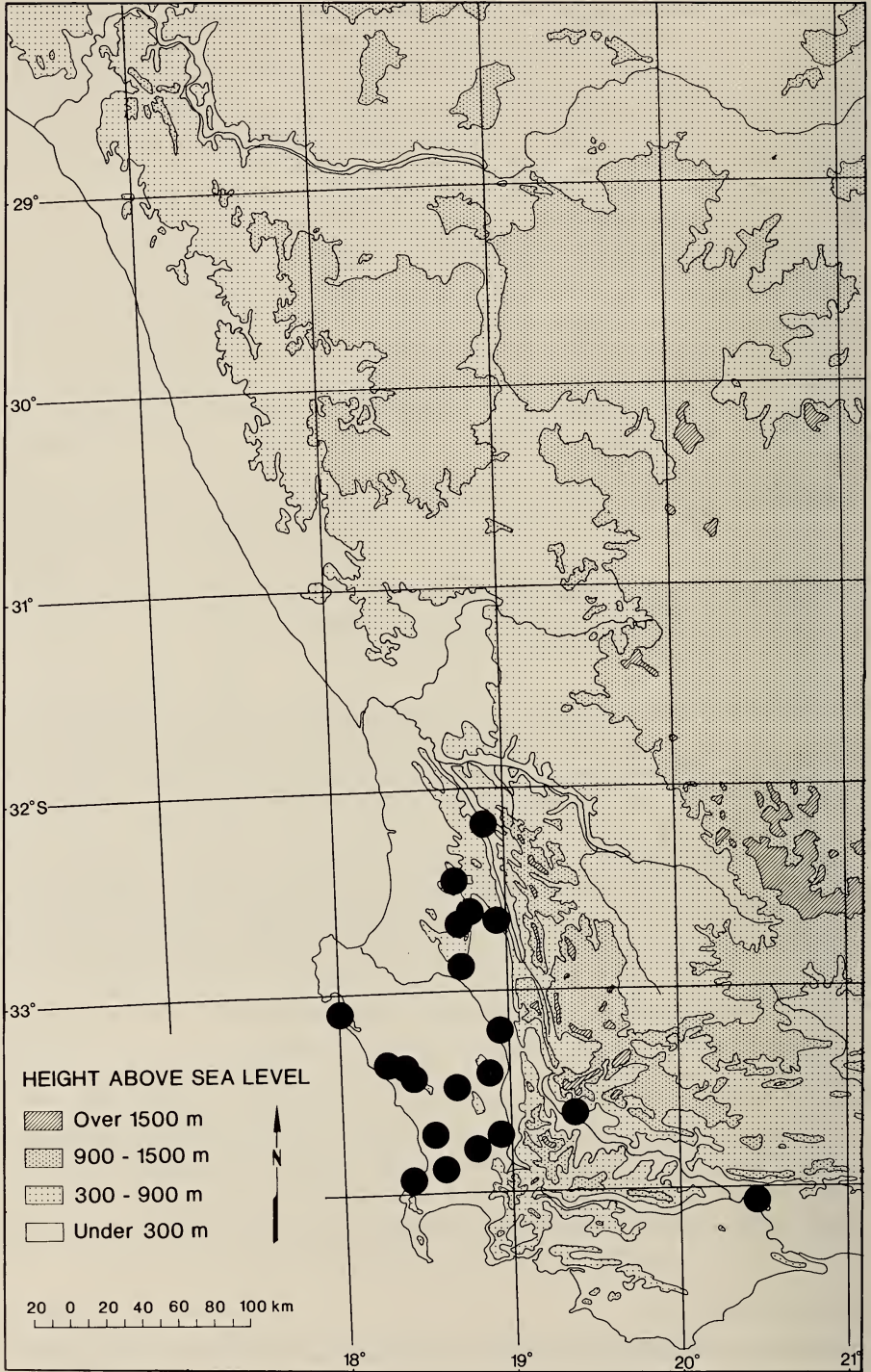


Fig. 49. Known distribution of *Rediviva peringueyi*.

*racemosa*, its favoured oil host plant, on the other hand ranges much more widely, but the presence of orchids, which occur late in the season, often when other oil-producing plants are declining, may be more critical than *Hemimeris* to the well-being of this species.

***Rediviva parva* sp. nov.**

Figs 1C, 50–54, 61E

*Diagnosis*

*Female*: small, 9–12 mm, dark bodied. Mesosoma: pale straw-coloured to black pubescence; front coxa without apical spine; tibia and tarsus of all legs with light brown hairs, oil-collecting hairs on tarsomeres 2–5 of front legs and 2–4 of middle legs; hind basitarsus without scale on distal dorsal angle. Metasoma: T1–T4 with apical hair bands pale straw-coloured to black, light brown on T5–T6, hair bands less conspicuous on dark forms and worn females.

*Male*: small, 8–10 mm. Mesosoma: tibia and tarsus of front and middle legs black to light brown. Metasoma: conspicuous white apical hair bands on T2–T5, sub-erect black hairs on basal two-thirds of T3–T5; S6 with poorly developed lobes, S7 having long narrow lanceolate median lobes with branched hairs on surface of distal half, apical hairs as long as lobe. Apical third of gonoforceps with short stout unbranched hairs.

*Etymology*

From the Latin *parvus*, referring to the small size of members of this species.

*Material examined*

*Type material. Holotype*: SAM-HYM-B007517, female, Western Cape Province, Clanwilliam, 20 km south, farm Holfontein, 3218BD, V. B. Whitehead, 8 Aug. 1984. *Allotype*: SAM-HYM-B007518, male, Western Cape Province, Clanwilliam, 20 km south, farm Holfontein, 3218BD, V. B. Whitehead, 29 July, 1984. *Paratypes* (97 ♀♀, 26 ♂♂)—*Northern Cape Province*: 3 ♀♀, Hondeklipbaai, farm Diknek, 3017AC, VBW, 20 Aug. 1991; 3 ♀♀ same locality, VBW, 18 Aug. 1995; 3 ♀♀, Nieuwoudtville, 3119AC, VBW, 29 Aug. 1994. *Western Cape Province*: 1 ♀, Atlantis, 3318AB, VBW, 16 Sept. 1985; 1 ♀, Cape Point Nature Reserve, 3418AD, KES, 8 Oct. 1986; 3 ♀♀, Clanwilliam, 3 km south, 3218BB, KES, 3 Sept. 1986; 3 ♀♀, Clanwilliam, farm Klawervlei, 3218DD, VBW, 20 Aug. 1984; 3 ♀♀, Clanwilliam, 6 km south, 3218BB, VBW, 10 Sept. 1984; 2 ♀♀, Clanwilliam, Ramskop Camp Ground, 3218BB, VBW & MM, 20 Aug. 1984; 1 ♀, same locality, VBW & MM, 21 Aug. 1984; 3 ♀♀, Darling-Yserfontein Road, farm Slangkop, 3318AD, KES, 17 Sept. 1986; 3 ♀♀, same locality, KES, 18 Sept. 1986; 1 ♀, Elandsbaai, farm Skerpheuwel, 3218AD, KES, 28 Aug. 1987; 1 ♀, same locality, KES, 9 Sept. 1987; 5 ♀♀, same locality, KES, 11 Aug. 1988; 5 ♀♀, Elandsbaai, 3218AD, VBW, 21 Sept. 1984; 5 ♂♂, same locality, VBW, 11 Aug. 1988; 3 ♀♀, Gouda, Voëlville Water Purification Plant, 3319AC,

VBW, 6 Sept. 1988; 3 ♀♀, Graafwater, 3218AB, KES, 14 Sept. 1984; 4 ♀♀, Hetkruis, farm Groenrivier, 3218DB, VBW, 22 Sept. 1988; 7 ♂♂, same locality, VBW, 19 Aug. 1992; 3 ♀♀, Hopefield, farm Jantjiesfontein, 3218CD, VBW, 10 Sept. 1992; 3 ♀♀, 4 ♂♂, Hout Bay, opposite Duiker Island, 3418AB, KES, 11 Oct. 1986; 2 ♀♀, Klawer, 7.6 km north on N7, 3118DA, KES, 7 Aug. 1985; 6 ♀♀, same locality, 3118DA, KES, 6 Aug. 1988; 3 ♀♀, Mamre, 3318AD, KES, 16 Sept. 1985; 3 ♀♀, Montagu, 10 km east, farm Rietvlei No. 1, 3320CC, VBW, 26 Aug. 1981; 2 ♀♀, Piketberg, 19 km north, 3218DB, VBW, 27 Aug. 1987; 1 ♂, Sandberg Station, farm Droogerivier, 3218BC, VBW, 27 Aug. 1987; 2 ♀♀, same locality, VBW, 19 Sept. 1987; 3 ♀♀, Sauer, 3218DC, VBW, 9 Sept. 1994; 4 ♀♀, Stellenbosch, farm Joostenbergkloof, 3318DD, VBW, 16 Sept. 1986; 1 ♂, same locality, VBW, 14 Aug. 1988; 1 ♀, same locality, VBW, 16 Aug. 1988; 4 ♀♀, Swellendam, Bontebok National Park, 3420AB; KES, 29 Sept. 1987; 4 ♀♀, Velddrif, 13.4 km east, farm Doornfontein A, 3218CD, VBW, 15 Sept. 1994; 5 ♀♀, 5 ♂♂, Vanrhynsdorp, 3318DA, H. Brauns, Aug. 1927; 1 ♂, Vanrhynsdorp, 10 km north, 3318DA, VBW, 11 Aug. 1995; 1 ♀, Vanrhynsdorp, 3318DA, VBW, 14 Aug. 1995; 1 ♀, same locality, VBW, 28 Aug. 1995. *Other material* (299 ♀♀, 37 ♂♂)—*Northern Cape Province*: 5 ♀♀ Hondeklipbaai, 3017AD; 4 ♀♀ Koinaas, 3017AB; 11 ♀♀, Kotzesrus, 3017DD; 12 ♀♀, Nieuwoudtville, 3119AC. *Western Cape Province*: 5 ♂♂, Camps Bay, 3318CD; 2 ♀♀, Cape Town, 3318CD; 3 ♀♀, Citrusdal, 3219CA; 84 ♀♀, 3 ♂♂, Clanwilliam, 3218BB; 14 ♀♀, Darling, 3318AD; 14 ♀♀, Elandsbaai, 3218AD; 25 ♀♀, Gouda, 3319AC; 3 ♀♀, Graafwater, 3218BA; 10 ♀♀, 6 ♂♂, Hetkruis, 3218DA; 11 ♀♀, Hopefield, 3318AB; 13 ♀♀, 11 ♂♂, Hout Bay, 3418AB; 5 ♀♀, Hondeklipbaai, 3017AD; 18 ♀♀, Klawer, 3118DC; 1 ♀, Lambert's Bay, 3218DC; 6 ♀, Malmesbury, 3318BC; 4 ♀♀, Montagu, 3320CC; 4 ♀♀, Melkbosstrand, 3318CD; 4 ♀♀, Moorreesburg, 3318BA; 1 ♀, Paleisheuwel, 3218BC; 17 ♀♀, Piketberg, 3218DA; 1 ♀, Porterville, 3318BB; 1 ♀, Riebeek-Kasteel, 3318BD; 3 ♀♀, 7 ♂♂, Sandberg Station, 3218BC; 11 ♀♀, 4 ♂♂, Sauer, 3218DC; 8 ♀♀, 1 ♂, Stellenbosch, 3318DD; 13 ♀♀, Swellendam, 3420AB; 2 ♀♀, Vanrhynsdorp, 3118DA; 9 ♀♀, Yserfontein, 3218BA.

### *Description*

#### *Female*

*Measurements. Holotype*: body 9.7 mm, forewing 9.5 mm, malar space L : W 0.25. *Other material* (n = 30)—*Measurements and ranges*: body 10.5 mm (9.5–11.5 mm), foreleg 8.7 mm (8.0–9.2 mm), forewing 8.2 mm (7.3–8.5 mm), Ft+b 2.9 mm (2.6–3.0 mm). *Ratios*: FL : B 0.83 (0.75–0.92), malar space (n = 10) L : W 0.22 (0.16–0.23).

*Integumental colour*. Head, scape, pedicel and basal four-fifths of first flagellar segment black, rest of flagellum dark brown to black above, brown below. Meso- and metasoma black to dark brown, legs black, hind tibia and basitarsus light brown.

*Structure*. Head: disc of clypeus shallowly concave; mouth-parts (Fig. 50A–H): glossa half length of prementum, labial palp extending to tip of glossa, paraglossa one-quarter length of glossa; ligular process occupying basal



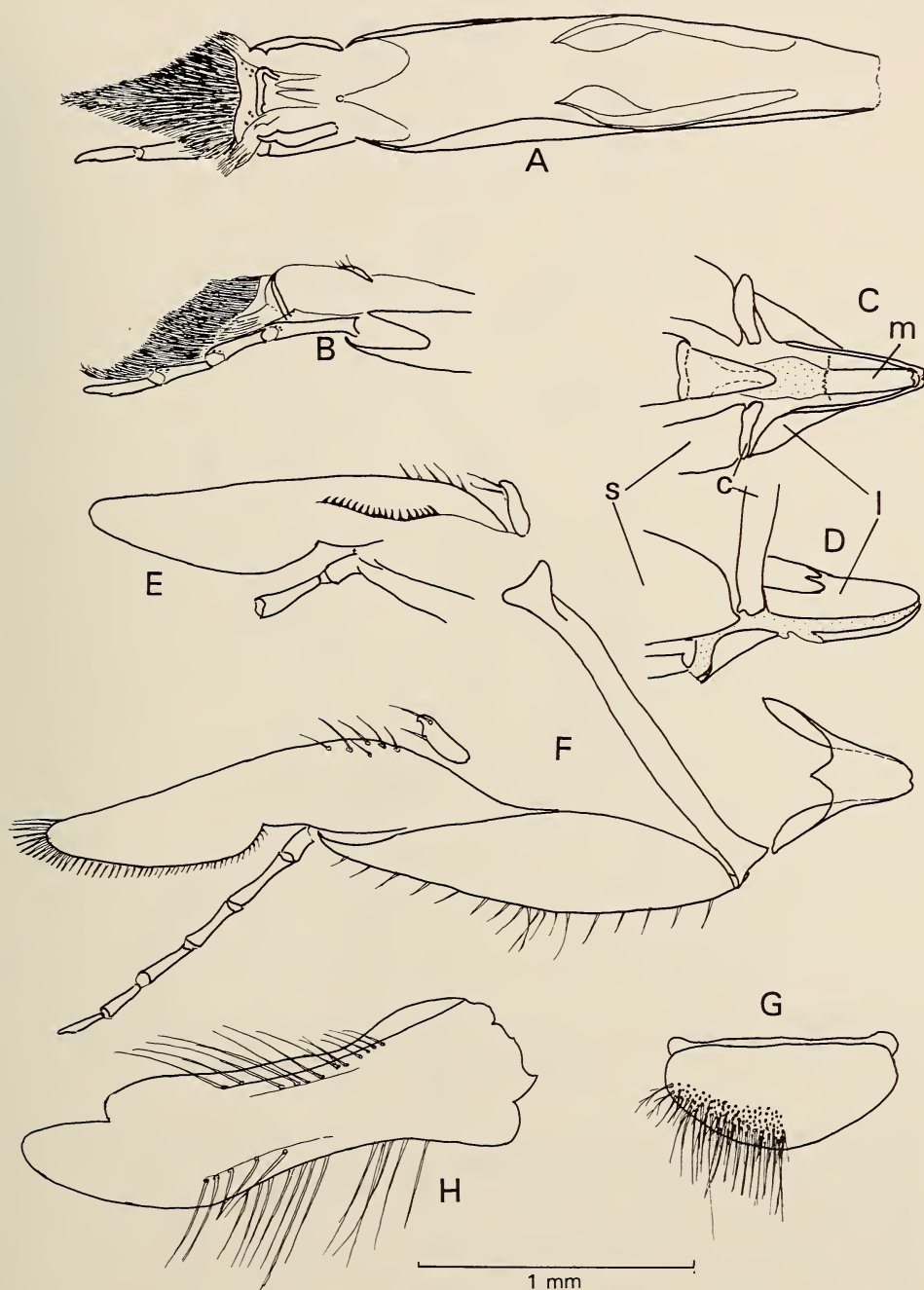


Fig. 50. *Rediviva parva* sp. nov. Female. A. Labium, anterior view. B. Distal part of labium, lateral aspect. C. Base of labium and associated sclerites, posterior view (c—cardo, l—lorum, m—mentum). D. Base of labium and associated sclerites, lateral view. E. Inner view of galea to show comb. F. Maxilla. G. Labrum. H. Left mandible.

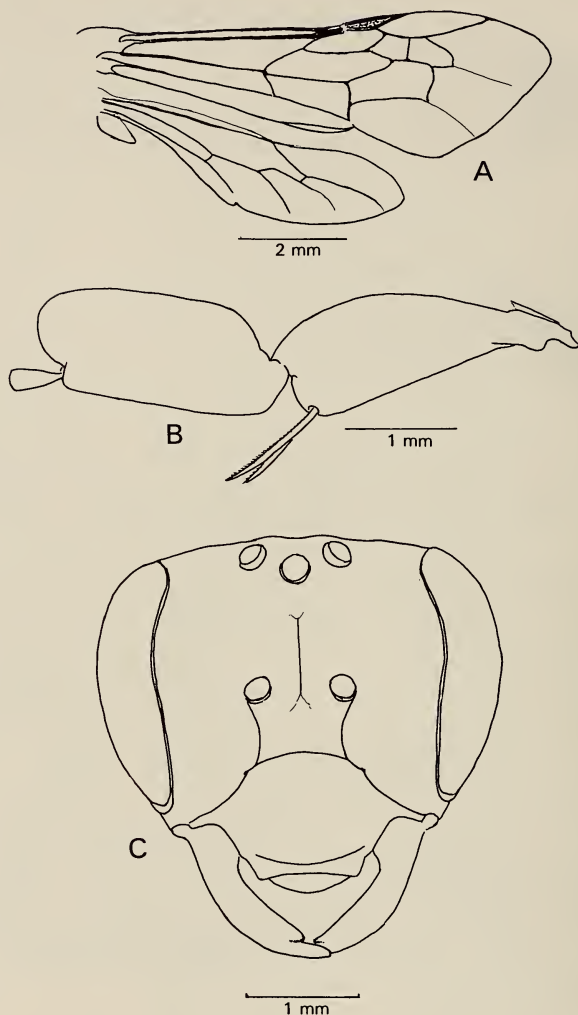


Fig. 51. *Rediviva parva* sp. nov. Female. A. Right wings. B. Hind tibia and basitarsus. C. Head, anterior view.

half of prementum (Fig. 50A); small triangular sclerite at junction of cardo and stipes; cardo slightly shorter than stipes, galea slightly longer than stipes, apex narrowly rounded (Fig. 50F), galeal comb of 17 teeth (Fig. 50E). Labrum (Fig. 50G) evenly convex apically, twice as wide as long. Mesosoma: forelegs shorter than body, hind basitarsus (Fig. 51B), nearly three times as long as wide (62 : 22), slightly narrower than hind tibia (22 : 25), without scale on distal dorsal angle, distal margin rounded, extending beyond the insertion of tarsomere 2. Propodeal triangle small, poorly defined.

*Sculpture.* Head: clypeus coarsely punctured, diameter of punctures less than distance between them, surface between punctures shiny, apical margin

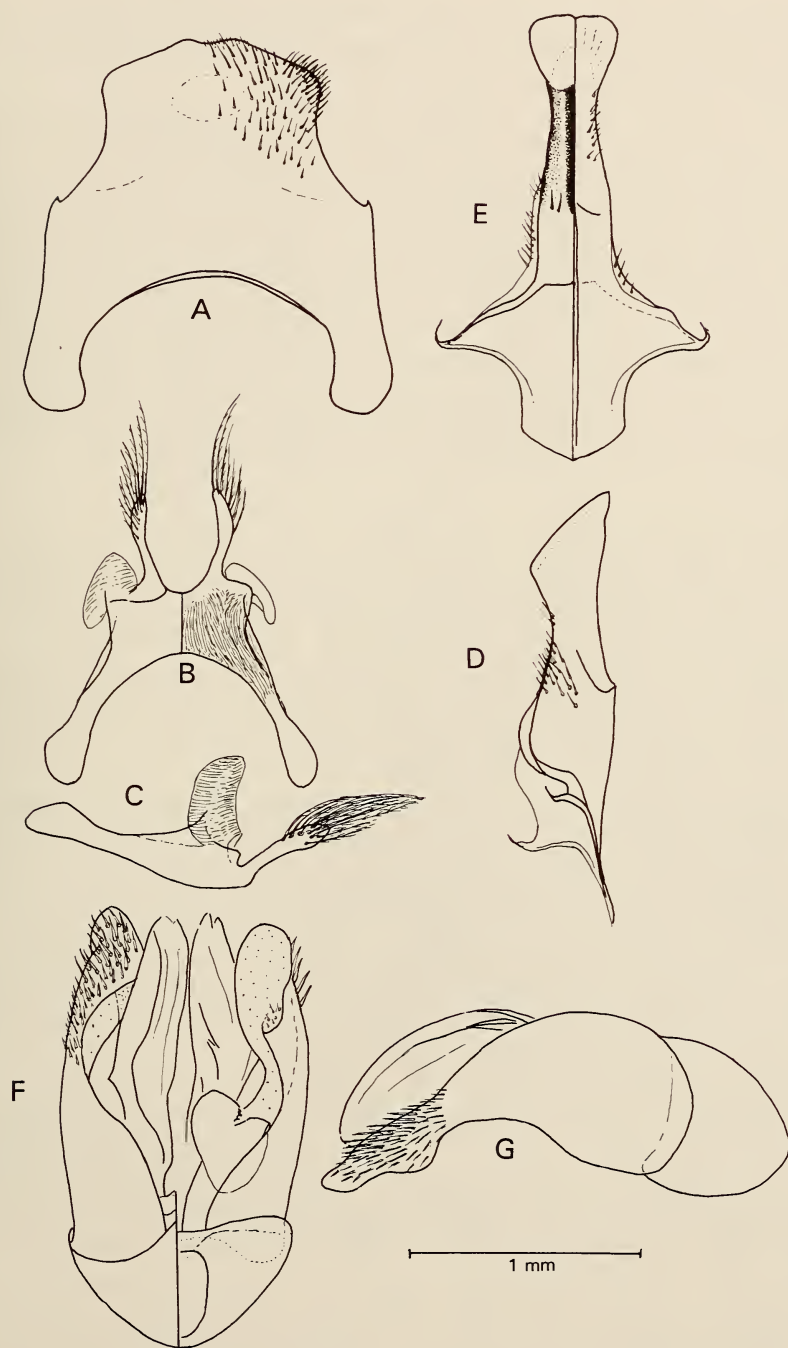


Fig. 52. *Rediviva parva* sp. nov. Male. A. S6, ventral view. B. S7, dorsal and ventral view. C. S7, lateral view. D. S8, lateral view. E. Dorsal and ventral view of S8. F. Dorsal and ventral view of genitalia. G. Genital capsule, lateral aspect.



impunctate. Mesosoma: punctation on disc of scutum fine, distance between punctures three to four times their diameter; propodeal triangle shiny, rest of propodeal surface punctate with scattered wrinkles.

*Vestiture.* Head: labrum with long, stout unbranched hairs on apical margin, shorter branched hairs interspersed; clypeus, supraclypeal and paraocular areas and frons with long white plumose hairs, some black branched hairs on inner ocular margin; long plumose white hairs on genal areas. Mesosoma: scutum with mixture of short plumose black and white hairs; scutellum and metanotum with light brown plumosity, longer white to straw-coloured on propodeum, hairs light brown to black in dark forms; coxa, trochanter and femur of all legs with long white branched hairs, light brown and shorter on tibia and tarsus, finely divided oil-collecting hairs on tarsomeres 2, 3, 4 and 5 of forelegs; scrapers and oil-collecting hairs on tarsomeres 2, 3 and 4 of middle legs. Metasoma: apical hairbands on T2–T4, varying from white, straw-coloured, piceous to black depending on the colour form; fimbriae on T5 and T6 light brown.

#### *Male*

*Measurements.* Allotype: body 8.3 mm, forewing 7.0 mm, malar space L : W 0.23. Other material (n = 10)—*Measurements and ranges*: body 9.4 mm (8.8–10.3 mm), foreleg 7.7 mm (7.6–7.9 mm), wing 7.9 mm (7.8–8.2 mm). *Ratios*: FL : B 0.82 (0.74–0.89), malar space L : W 0.24 (0.19–0.27).

*Integumental colour.* Head: antennae, basal three-quarters of mandible black; mesosoma black, tegulae dark brown; tibia and tarsus of front and middle legs black to light brown, hind tibia and basitarsus light brown; metasoma black, lateral margin of T1 reddish-brown.

*Structure.* Front legs four-fifths length of body. S6 with median and lateral lobes poorly developed, tuft of short, strong unbranched hairs on lateral lobe (Fig. 52A); S7 (Fig. 52B–C) with long narrow lanceolate median lobes, long finely branched hairs on lateral surface of distal half, terminal hairs as long as lobe; lateral lobes translucent, strigate, as long as median lobes; ventral surface of S7 costulate; S8 (Figs 52D–E, 63E), apical plate spade-shaped, shallowly concave, lateral margins diverging distally, distal margin shallowly crenulate. Genital capsule (Fig. 52F–G): gonoforceps not extending beyond tip of penis valves, apical third with stout unbranched hairs.

*Vestiture.* Head: long unbranched golden to light brown hairs on distal margin of labrum, long silky white plumose hairs on clypeus, supraclypeal and paraocular areas, some black hairs on inner ocular margin. Mesosoma: long white plumose hairs on episternal areas; scutum and metanotum with similar vestiture, some black hairs on scutellum. Metasoma: white hairbands on apical margin of T2–T5, short black sub-erect hairs on basal two-thirds of T3–T5, fimbriae on T6–T7 light brown.

The colour of the pubescence on the basal area of terga can be used to differentiate the males of *R. parva*, *R. albifasciata* and *R. aurata*. The basal area of T2–T5 of *R. parva* has obvious sub-erect black hairs whereas this area in *R. albifasciata* is smooth and shiny with hairs not readily discernible. *Rediviva aurata* has predominantly erect pale straw-coloured to white hairs on the base of T3–T4 with some black erect hairs on T5.

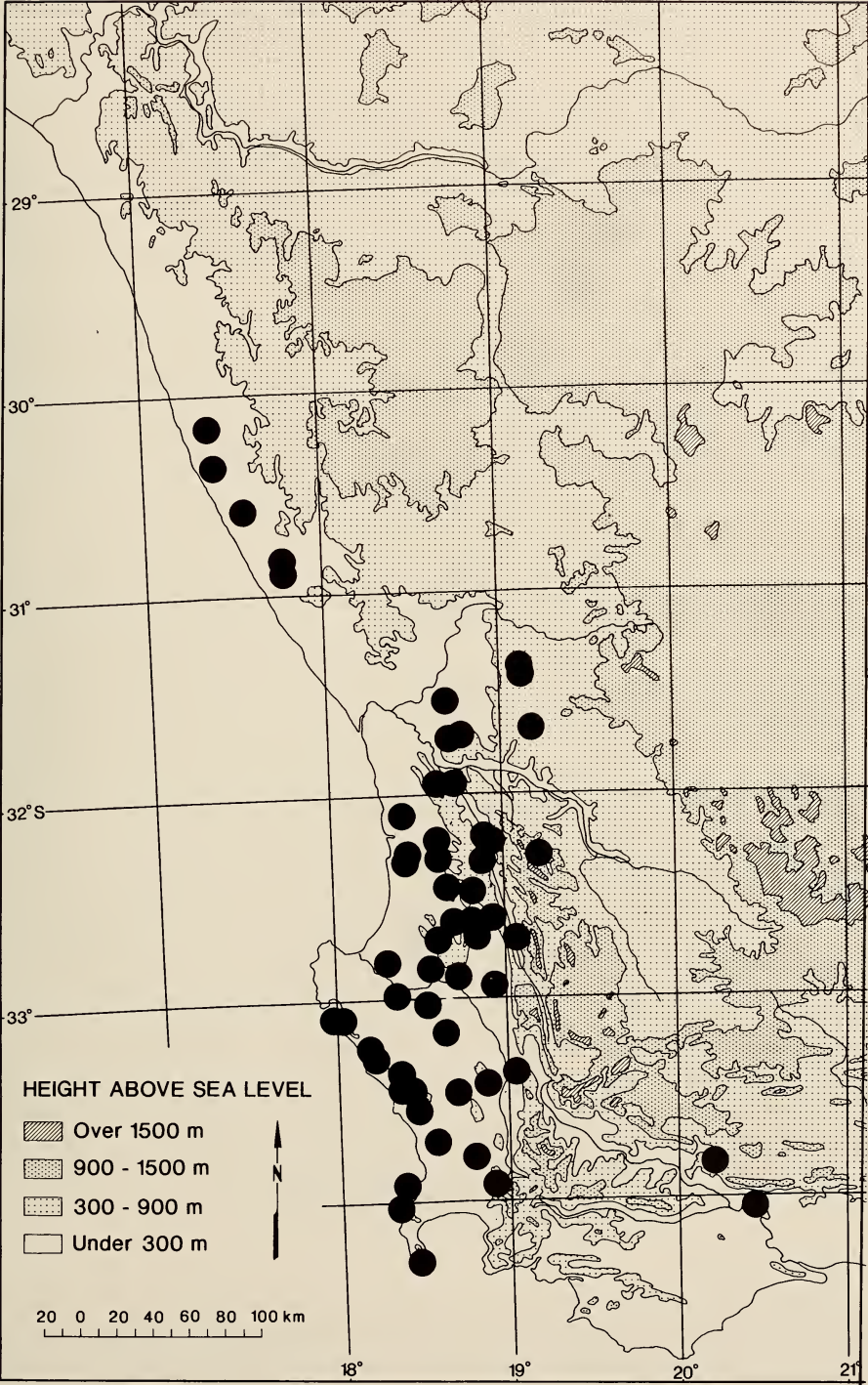


Fig. 53. Known distribution of *Rediviva parva* sp. nov.

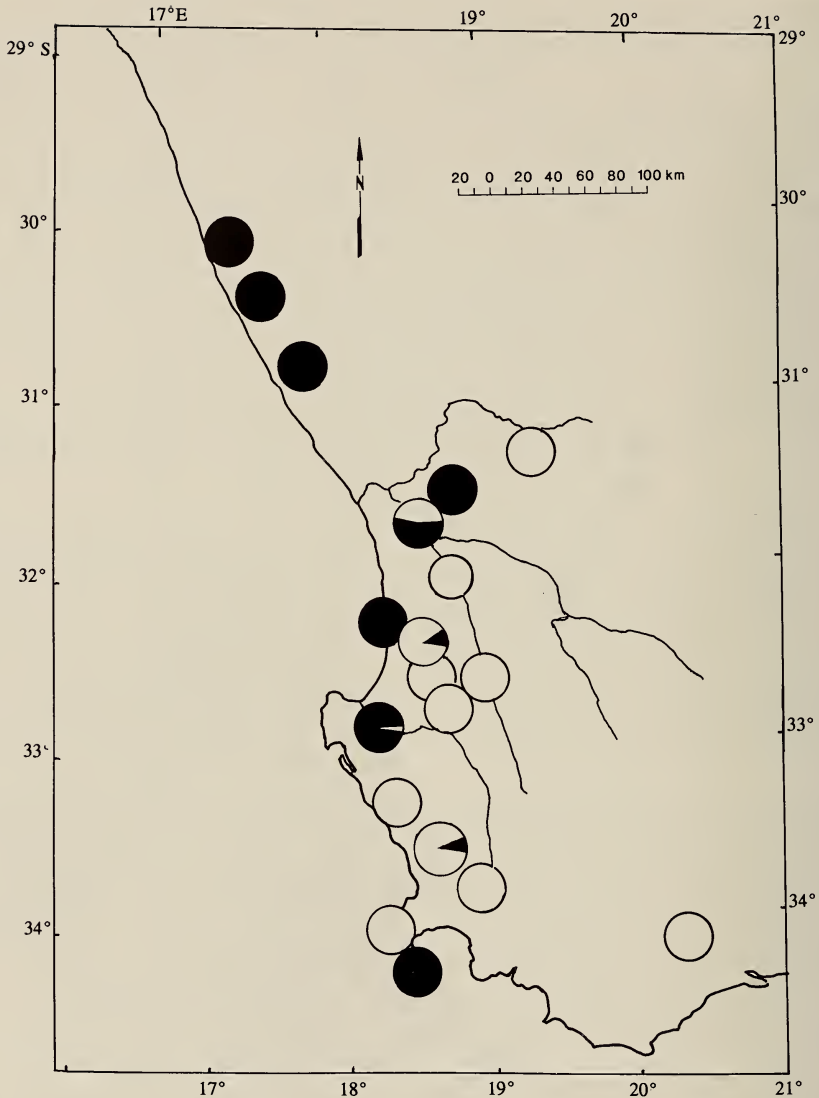


Fig. 54. Proportion of dark-haired to light-haired females of *Rediviva parva* sp. nov. at various localities in the Western and Northern Cape provinces. Symbols: ○ = white-haired form; ● = black-haired form; wedges of white or black indicate proportion of white- or black-haired forms at that locality.

#### *Host flower records*

Females collect oil from fourteen species of oil-producing plants. These are *Hemimeris racemosa*, *H. sabulosa* and *Alonsoa unilabiata* as well as 11 species of *Diascia*, which include *Diascia capensis*, *D. pachyceras*, *D. lewisiae*, *D. batteniana*, *D. 'arenicola'*, *D. 'arenicola'* ssp. '*bulbosa*', *D. 'grantiana'*, *D. elongata*, *D. ellaphieae*, and *D. 'speciosa'*. Nectar plants visited by females



are *Moraea miniata*, *Oxalis obtusa*, *O. pes-caprae*, *Cysticapnos vesicaria*, *Geissorhiza aspera*, *Wachendorfia paniculata*, *Nylandtia spinosa*, *Heliophila* and *Trachyandra* spp.

Males occasionally patrolled oil host plants and have been collected cruising over *H. racemosa* and *D. capensis* but the greatest number were collected on six species of nectar plants. The majority (52%) were visiting *O. pes-caprae*, *O. obtusa* and an unidentified *Oxalis*. *Cysticapnos vesicaria* was also attractive and 10 per cent were taken on this plant. The remaining males were on *M. miniata*, *Hermannia* sp. and *Wachendorfia paniculata*.

#### *Distribution* (Fig. 53)

*Rediviva parva* has been found on the coastal plain from Hondeklipbaai in the Northern Cape to Cape Point in the Western Cape. Inland it occurs on the Nieuwoudtville plateau and along the western side of the inland range to Stellenbosch. Disjunct populations occur further east at Montagu and Swellendam. It is possible that its eastward range is restricted by the absence of *Hemimeris racemosa*, its most favoured host plant.

#### *Colour forms* (Fig. 54)

Females have a black integument and the majority have white to pale straw-coloured vestiture. However, some individuals have a darker pubescence, dark brown to black, the extent of which varies from completely to partially black with light-coloured pubescence on the metanotum, propodeum and lateral margins of the metasomal terga. The proportion of darker forms in any one population varies according to location (Fig. 54). The northern populations at Koingnaas, Wallekraal, Kotzesrus and Vanrhynsdorp have only dark individuals, as do Elandsbaai and Cape Point populations further south. Dark, intermediate and light-coloured forms occur together at Bergriver Station (97% dark and intermediate), Klawer (54% dark and intermediate), Sandberg Station (12% dark and intermediate) and Koeberg Hill (9% dark and intermediate).

Males collected in areas where dark females predominate tend to have dark brown pubescence, particularly the apical hair bands on the metasomal terga.

One can only speculate as to the cause of darkening of the pubescence, but it is evident that the northern populations all occur on dune systems and soils in areas such as Elandsbaai and Bergriver Station are extremely sandy. On the heavier clay soils of Piketberg and Nieuwoudtville no dark forms have yet been collected.

#### *Rediviva alonsoae* sp. nov.

Figs 1H, 55-58, 63F

#### *Diagnosis*

*Female*. Dark-bodied, medium-sized bees, 11-13 mm. Mesosoma: forelegs not attenuated, three-quarters length of the body; oil-collecting hairs restricted to distal portion of the basitarsus and tarsomeres 2-4 of the foreleg, no oil-collecting hairs on tarsus of middle leg; hind basitarsus lacks scale-like

projection on the distal dorsal angle. Metasoma: pale yellow apical hair bands on terga 2–4.

*Male.* Dark-bodied, medium-sized bees, 9–11 mm. Mesosoma: pubescence of legs straw-coloured to light brown. Metasoma: light brown diffuse apical hair bands on T1–T4, erect black hairs on basal half of T4 and basal two-thirds of T5, fimbriae of T6 light brown, of T7 black. Apical third of S6 concave.

### *Etymology*

Females collect oil only from *Alonsoa unilabiata* (Scrophulariaceae), hence *alonsoae*.

### *Material examined*

*Type material.* *Holotype*: SAM-HYM-B007511, female, Northern Cape, Middelpos, farm Blomfontein, 3120CC, K. E. Steiner, 3 Oct. 1995. *Allotype*: SAM-HYM-B001318, male, Northern Cape, Nieuwoudtville, Wild Flower Reserve, 3119AC, V. B. Whitehead, 4 Aug. 1988. *Paratypes* (26 ♀♀, 5 ♂♂)—*Northern Cape Province*: 1 ♀, Calvinia, farm Toren, 3119BC, KES, 26 Aug. 1985; 1 ♂, same locality, VBW & MM, 26 Aug. 1985; 3 ♀♀, Middelpos, farm Blomfontein, 3120CC, KES, 3 Oct. 1985; 9 ♀♀, Middelpos, farm Hartbeestfontein, 3120CC, KES, 2 Oct. 1986; 2 ♀♀, Middelpos, farm Blomfontein, 3019CC, VBW, 3 Oct. 1985; 6 ♀♀, Middelpos, farm Hartbeestfontein, 3120CC, VBW, 2 Oct. 1986; 1 ♂, Nieuwoudtville, Wild Flower Reserve, 3119AC, KES, 8 Aug. 1986; 1 ♀, Nieuwoudtville, farm Bokkefontein, 3119AC, KES, 25 Aug. 1988; 1 ♀, Nieuwoudtville, farm Glenlyon, 3119AC, KES, 24 Aug. 1990; 1 ♂, Nieuwoudtville, Wild Flower Reserve, 3119AC, KES & VBW, 2 Aug. 1984; 2 ♀♀, Nieuwoudtville, road to Teunisdrif, 13 km north-east from Grasberg Road, 3119AC, VBW, 25 Aug. 1985; 1 ♀, Nieuwoudtville, farm Glenlyon, 3119AC, VBW, 11 Sept. 1987; 1 ♂, Nieuwoudtville, Wild Flower Reserve, 3119AC, VBW, 19 Aug. 1988; 1 ♂, same locality, VBW, 10 Sept. 1996. *Other material*: 11 ♀♀, Nieuwoudtville Wild Flower Reserve, 3119AC, VBW, 29 Aug. 1995; 6 ♀♀, same locality, VBW, 31 Aug. 1995; 6 ♀♀, same locality, VBW, 6 Sept. 1995.

### *Description*

#### *Female*

*Measurements.* *Holotype*: body 12.0 mm, forewing 9.8 mm, malar space L : W 0.21. *Other material* (n = 10)—*Measurements and ranges*: body 11.9 mm (11.2–13.2 mm), foreleg 9.7 mm (9.5–10.3 mm), wing length 9.2 mm (9.0–9.8 mm), Ft+bt 3.1 mm (2.9–4.2 mm). *Ratios*: FL : B 0.82 (0.76–0.87), malar space L : W 0.23 (0.21–0.25).

*Integumental colour.* Body and legs black, tegulae and underside of flagellum dark brown.

*Structure.* Mouth-parts (Figs 55A–E, 56E): glossa one-third length of prementum, labial palps extending beyond tip of glossa, paraglossae extending to one-third length of glossa; ligula arms occupying basal half of prementum (Fig. 55A); galeal comb of 21 teeth (Fig. 55B); labrum wider than long (12 : 5),

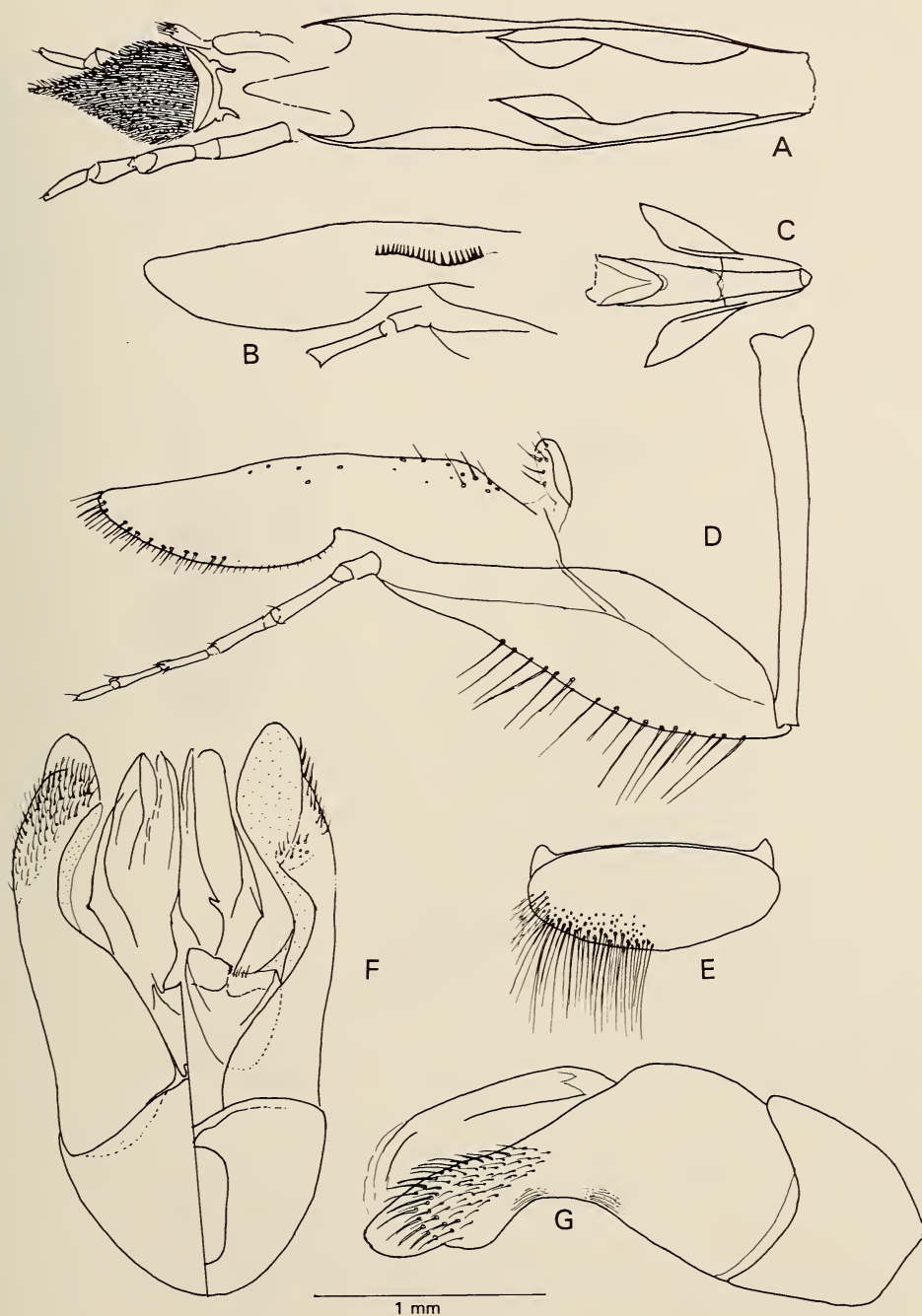


Fig. 55. *Rediviva alonsoae* sp. nov. Female. A. Labium, anterior view. B. Inner view of galea to show comb. C. Base of labium and associated sclerites, posterior view. D. Left maxilla. E. Labrum. F. Dorsal and ventral view of genitalia. G. Lateral aspect of genital capsule.



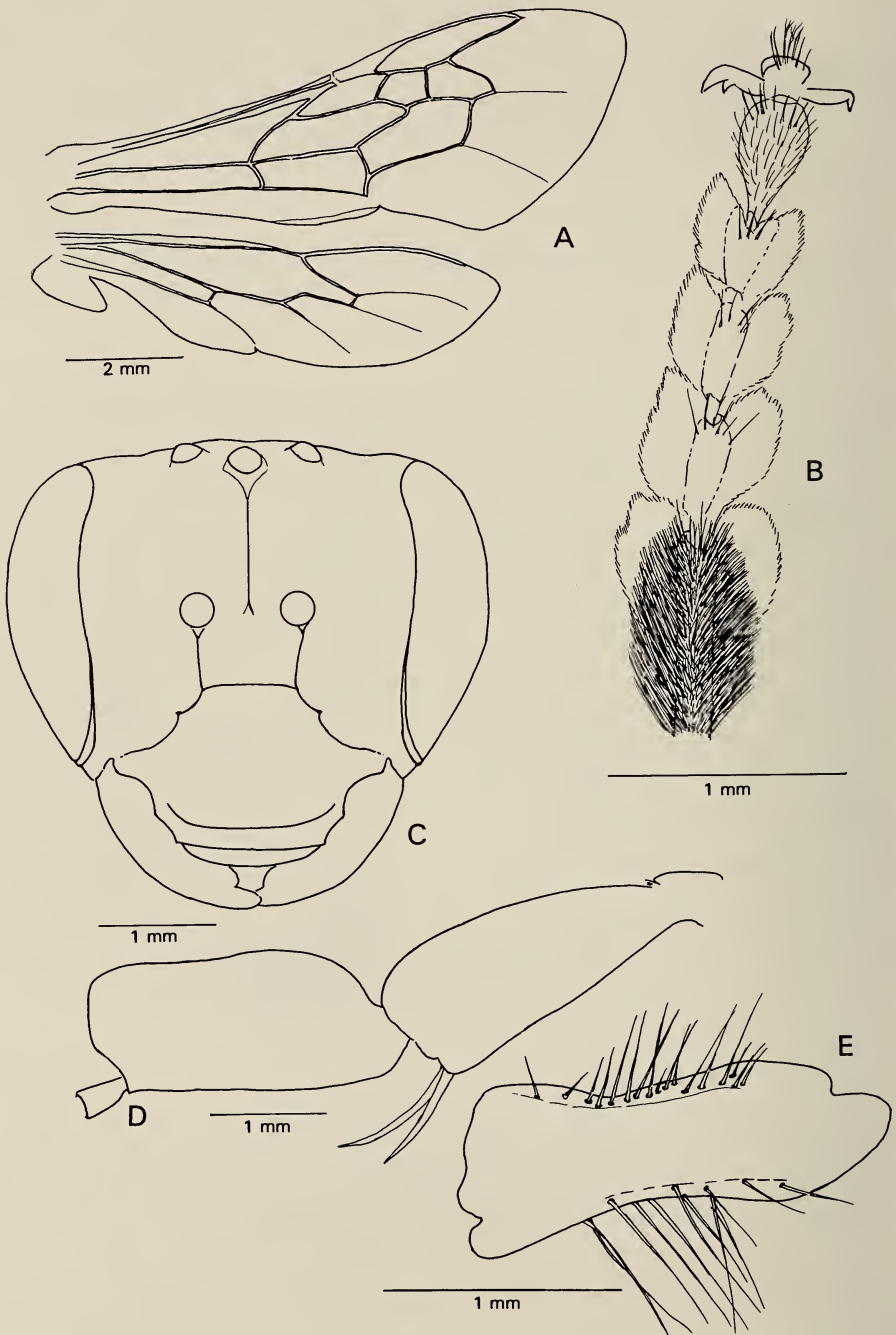


Fig. 56. *Rediviva alonsoae* sp. nov. Female. A. Right wings. B. Distal part of front basitarsus plus tarsomeres 2-5. C. Anterior view of head. D. Tibia and basitarsus of hind leg. E. Right mandible.

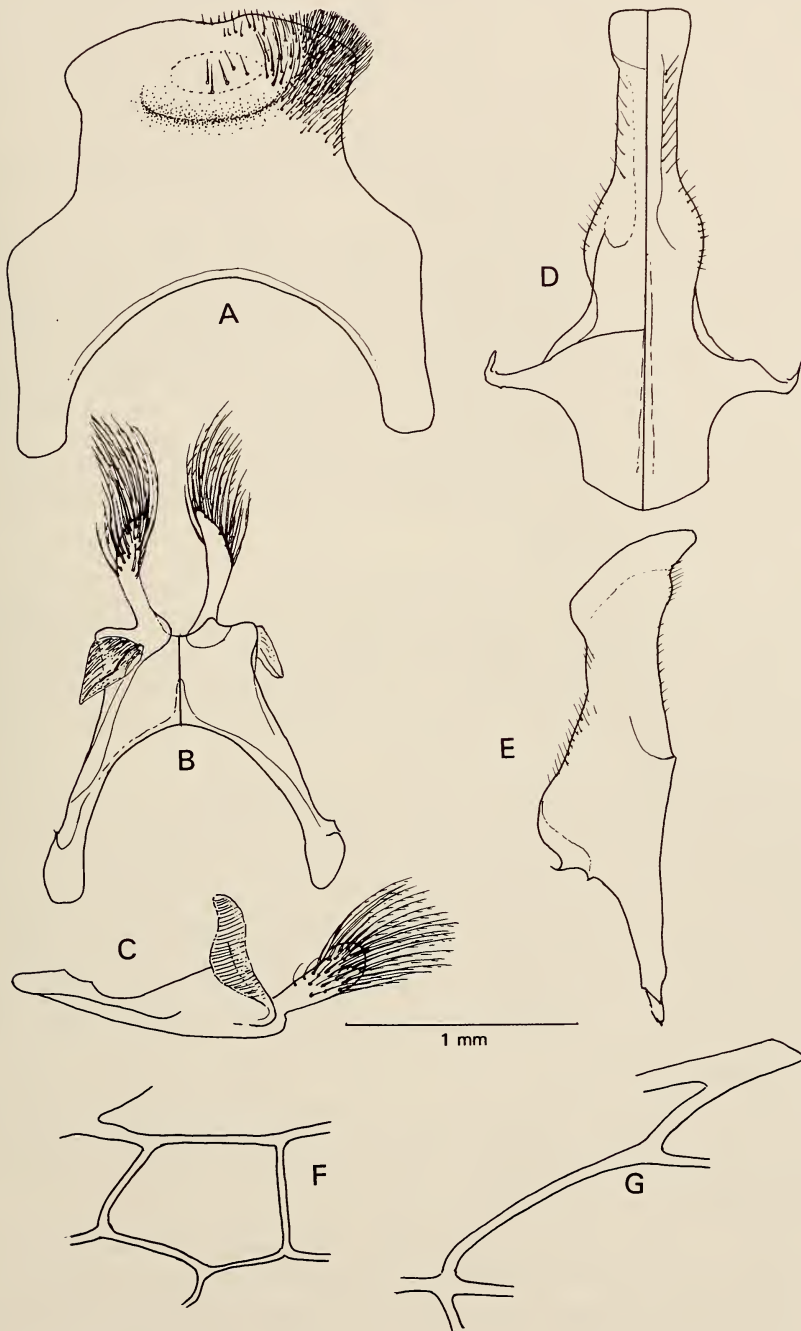


Fig. 57. *Rediviva alonsoae* sp. nov. Male. A. Ventral view of S6. B. Dorsal and ventral aspect of S7. C. Lateral view of S7. D. Dorsal and ventral view of S8. E. Lateral view of S8. F-G. Female. F. Second submarginal cell of right forewing. G. Basal vein and first abscissa of Rs of right forewing.

apical margin convex, evenly rounded (Fig. 55E). Mesosoma: forelegs not elongate, four-fifths length of body, hind tibia nearly as wide as hind basitarsus (3.1 : 3.3), hind basitarsus broad, length 2.3 times width, without scale-like projection on distal dorsal angle, distal margin truncate extending beyond insertion of tarsomere 2 (Fig. 56D).

*Sculpture.* Clypeus coarsely punctate, surface between punctures shiny, apical margin impunctate, shiny; labrum punctate on apical third; scutum finely punctate, areas between punctures shiny.

*Vestiture.* Head: pubescence on underside of head, white to straw-coloured. Mesosoma: hairs on scutum, scutellum and metanotum as well as pleura and mesosternum straw-coloured; tibia and tarsus of all legs with light brown pubescence; finely branched oil-collecting hairs on front tarsomeres 2–4 and on distal quarter of front basitarsus (Fig. 56B), no oil-collecting hairs on tarsomere 5 of front leg or on tarsus of middle leg. Metasoma: terga 2–4 with apical bands of pale yellow decumbent hair, sometimes less prominent on disc of T2–T3 especially on older specimens, sub-erect hair of same colour on basal two-thirds of T2–T3, some erect black hairs on middle of T4; fimbriae on T5 black basally, brown apically.

#### *Male*

*Measurements.* Allotype: body 11.8 mm, forewing 9.0, malar space L : W 0.19. Other material (n = 2)—*Measurements and ranges*: body 10.4 mm (9.8–11.0 mm), forewing 7.7 mm (7.5–7.8 mm), foreleg 8.3 mm (8.0–8.6 mm), Ft+bt 2.9 mm. Ratios: FL : B 0.80 (0.73–0.88), malar space L : W 0.19 (0.17–0.21).

*Integumental colour.* Body, legs and antennae black.

*Structure.* Mesosoma: forelegs approximately three-quarters length of body, hind tibia wider than basitarsus (2 : 1.5). Metasoma: S6 (Fig. 57A) with median and lateral lobes poorly developed, disc concave on distal third, strongly punctate basally; S7 (Fig. 57B–C) deeply emarginate apically with conspicuous spatulate median lobes terminating in strong curved branched hairs, lateral lobes well developed, strigate; S8 (Fig. 57D–E, 63F), apical plate sub-triangular, narrowing basally, distal margin entire; genital capsule (Fig. 55F–G), gonoforceps extending slightly beyond penis valves with short strong curved hairs on distal third.

*Sculpture.* Head: clypeus finely and densely punctured, areas between punctures shiny, anterior margin impunctate, shiny. Mesosoma: scutum finely punctate, less dense than clypeus, punctures of two sizes, surface between punctures shiny.

*Vestiture.* Head: clypeus, paraocular areas and frons covered with long white silky hairs; similar pubescence on underside of head. Mesosoma: scutum with shorter straw-coloured hairs mixed with black; scutellum with black hairs on disc, pale straw-coloured laterally; legs basally with white hairs becoming brown on tibia and tarsus. Metasoma: pubescence on metanotum straw-coloured; propodeum with vestiture black on disc, straw-coloured laterally; T2–T4 with light brown, diffuse, semi-decumbent apical hair bands, short erect



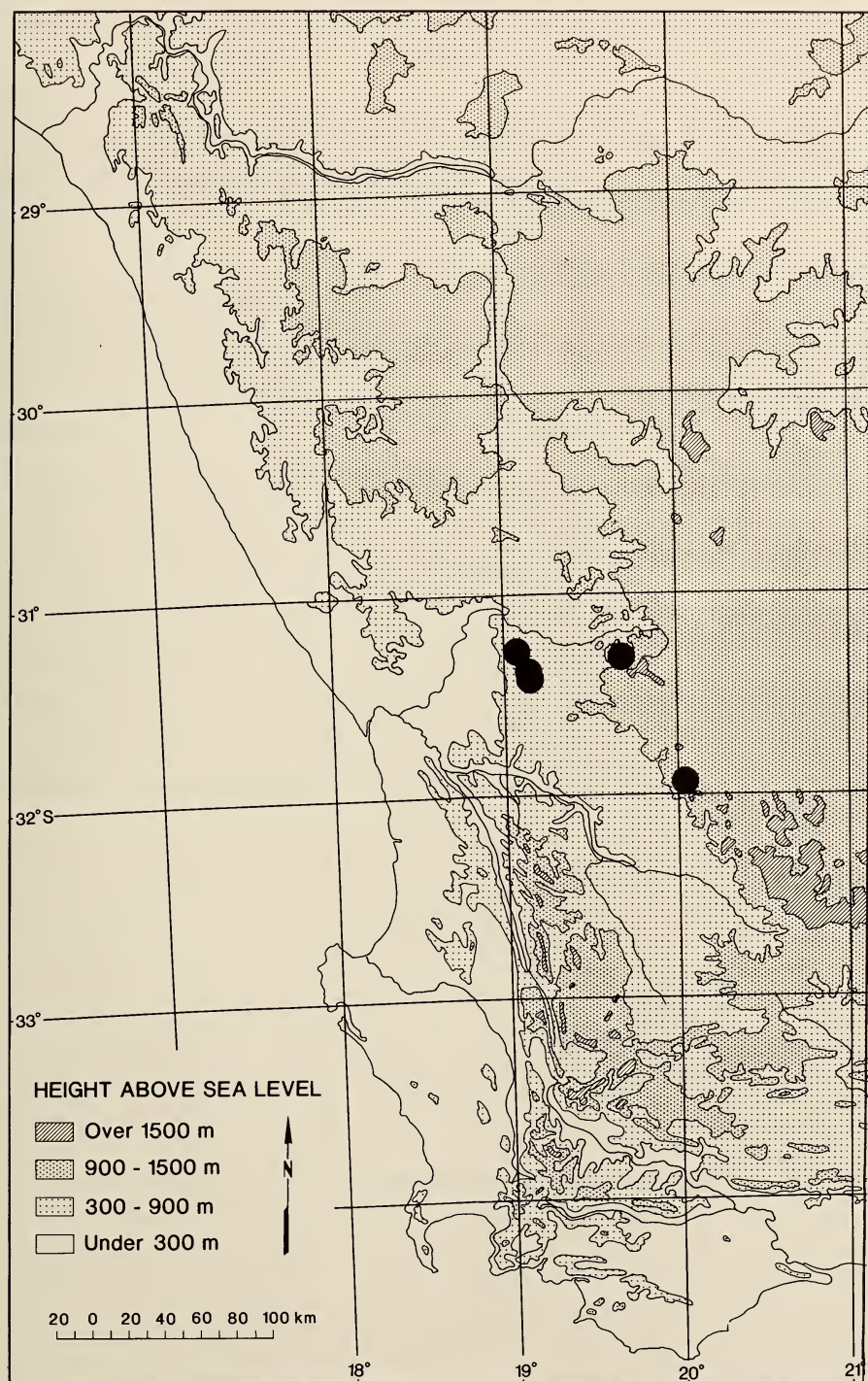


Fig. 58. Known distribution of *Rediviva alonsoae* sp. nov.

similar coloured hairs covering basal two-thirds of T2–T3, becoming black on T4–T5, fimbriae on T6 brown on T7 black.

#### *Host flower records*

Females collected oil exclusively from *Alonsoa unilabiata* and visited *Moraea bifida*, *Oxalis pes-caprae* and *O. obtusa* for nectar. Males obtained nectar from *Lotononis hirsuta*, *Oxalis obtusa* and an unidentified *Oxalis* sp.

#### *Distribution* (Fig. 58)

*Rediviva alonsoae* is a relatively scarce bee found on the farm Hartbeestfontein in the Middelpoort area and on the Wild Flower Reserve at Nieuwoudtville. Isolated specimens have also been collected on the farm Toren in the Calvinia district and on two farms at Nieuwoudtville.

#### *Discussion*

*Rediviva alonsoae* females may be confused with several other *Rediviva* species that lack the scale-like projection on the hind basitarsus. *Rediviva macgregori*, which is abundant in the area in which *R. alonsoae* occurs, has similar hair bands on the metasoma and also lacks the scale-like projection on the hind basitarsus. *Rediviva macgregori*, however, is larger (mean body length 12.8 mm) and has front legs longer than the body (14.7 : 12.8). *Rediviva peringueyi* and *R. parva* females also have similar hair bands on the metasoma and lack the scale-like projection on the hind basitarsus, but *R. parva* is considerably smaller (body length 10.4–10.6 mm) whereas *R. peringueyi*, which falls into the same size-group as *R. alonsoae* (body length 11.0–12.5 mm, mean 11.8), has a granulate surface between the punctures on the scutum. This area is shiny in *R. alonsoae*.

#### *Rediviva nitida* sp. nov.

Figs 2A, 59–62, 63G

#### *Diagnosis*

*Females*: medium to large (10–12 mm) black-bodied bees. Mesosoma: front legs approximately length of body (10–13 mm), oil-collecting hairs on tarsomeres 2–5, no oil-collecting hairs on tarsi of middle legs, hind basitarsus lacking scale on dorsal distal angle. Metasoma: terga covered with short appressed pile, often abraded on discal area, appressed hairs on T1 and T2 always pale, on T3 and T4 black on disc, pale straw-coloured on lateral margin, T5 with longer sub-erect light brown hairs, fimbriae of T6 of similar colour.

*Males*: body black, 10–11 mm. Mesosoma: hind legs with patch of black hairs on distal dorsal half of tibia and basitarsus. Metasoma: T2–T4 with erect straw-coloured hairs apically, black basally, proportion of pale hair progressively decreasing until T4 has only apical third pale and basal two-thirds black, T5 and T6 with black pubescence only. S6 with concavity on apical third, surface of depression shiny, coriaceous. Median cluster of erect black hairs on proximal edge of depression. S7 with well-developed spatulate median lobes, apical hairs approximately length of lobe, lateral lobes large, crescentic,

strigate.

### Etymology

*Nitidus* Latin for polished or shiny. Females of *R. nitida* have short appressed hairs on the metasomal terga which are often rubbed off on the discal area, giving the metasoma a polished appearance.

### Material examined

*Type material.* *Holotype*: SAM-HYM-B008052, female, Northern Cape, Nieuwoudtville, Wild Flower Reserve, 3119AC, V. B. Whitehead, 19 Aug. 1995. *Allotype*: SAM-HYM-B008053, Northern Cape, Nieuwoudtville, Nieuwoudtville Wild Flower Reserve, 3119AC, V. B. Whitehead, 22 Aug. 1996. *Paratypes* (168 ♀♀, 8 ♂♂)—*Northern Cape Province*: 1 ♀, Nieuwoudtville, 24 km north on Loeriesfontein road, 3119AB, VBW, 20 Aug. 1986; 1 ♀, Nieuwoudtville, 5 km south, 3119AC, VBW, 11 Sept. 1987; 1 ♀, same locality, VBW, 22 Aug. 1988; 7 ♀♀, Nieuwoudtville, Wild Flower Reserve, 3119AC, KES, 26 Aug. 1984; 8 ♀♀, same locality, KES, 28 Aug. 1984; 1 ♀, same locality, KES, 24 Sept. 1986; 1 ♂, same locality, VBW, 2 Aug. 1984; 2 ♀♀, same locality, VBW, 17 Aug. 1986; 1 ♀, same locality, VBW, 9 Sept. 1986; 1 ♀, same locality, VBW, 26 Sept. 1986; 1 ♀, same locality, VBW, 24 Aug. 1988; 4 ♀♀, same locality, VBW, 28 Aug. 1988; 1 ♀, same locality, VBW, 29 Aug. 1995; 8 ♀♀, same locality, VBW, 5 Sept. 1995; 1 ♂, same locality, VBW, 28 Aug. 1996; 4 ♀♀, same locality, VBW, 30 Aug. 1996; 3 ♀♀, same locality, VBW, 10 Sept. 1996; 3 ♀♀, same locality, VBW, 20 Sept. 1996; 2 ♀♀, same locality, VBW, 16 Oct. 1996; 8 ♀♀, same locality, VBW & MM, 26 Aug. 1984; 8 ♀♀, same locality, VBW & MM, 28 Aug. 1984; 1 ♀, same locality, VBW & MM, 10 Sept. 1984; 1 ♀, same locality, VBW & MM, 23 Aug. 1985; 21 ♀♀, same locality, VBW & MM, 27 Aug. 1985; 4 ♀♀, same locality, VBW & MM, 9 Sept. 1986; 1 ♀, Nieuwoudtville, farm Glenlyon, 3119AC, VBW, 11 Sept. 1987; 1 ♀, same locality, VBW, 3 Oct. 1996. *Western Cape Province*: 1 ♀, Amalienstein, Seweweekspoort turn off, 3321AD, VBW, 7 Oct. 1988; 3 ♀♀, same locality, VBW, 16 Aug. 1995; 2 ♀♀, Calitzdorp 3 km west, 3321DA, VBW, 18 Aug. 1985; 1 ♀, Calitzdorp 3.2 km west, 3321DA, KES, 11 Sept. 1985; 3 ♀♀, Calitzdorp 3.4 km west, 3321DA, KES, 15 Aug. 1985; 6 ♀♀, Calitzdorp 4 km north-west, 3321DA, VBW, 15 Aug. 1985; 3 ♀♀, 6.5 km north of Klawer turn off on N7, 3118DA, KES, 21 Aug. 1985; 1 ♂, same locality, KES, 7 Aug. 1985; 1 ♀, 7 km north-east of Klawer turn off on N7, 3118DA, VBW, 11 Aug. 1989; 1 ♀, Knersvlakte, Namaqualand, S. A. Museum staff, 1 Sept. 1961; 4 ♀♀, Ladismith, 2.6 km east on R62, 3321CB, VBW, 16 Sept. 1992; 4 ♀♀, Ladismith, farm Phisantefontein, 40 km south on R323, 3321CC, KES, 1 Sept. 1992; 9 ♀♀, same locality, VBW, 1 Sept. 1992; 1 ♀, Oudtshoorn, 20 km west on R62, 3321DB, VBW, 16 Aug. 1985; 4 ♀♀, 2 ♂♂, Oudtshoorn, 7 km south on R62, 3322CB, KES, 2 Sept. 1992; 14 ♀♀, 4 ♂♂, Oudtshoorn, Zebra turn off on R62, 3322CD, VBW, 16 Aug. 1985; 2 ♀♀, same locality, VBW, 7 Oct. 1988; 6 ♀♀, same locality, KES, 16 Aug. 1985; 2 ♀♀, Oudtshoorn, Blossoms turn off on R62, 3322CB, VBW, 16 Aug. 1985; 3 ♀♀, Oudtshoorn, Zebra turn off on R62, 3322CD, VBW, 26 Oct. 1987;



1 ♀, Oudtshoorn, 7 km south on R62, 3322CB, VBW, 2 Sept. 1992; 3 ♀♀, Vanrhynsdorp, 15 km south on N7, 3118DA, VBW & MM, 21 Aug. 1985.

### *Description*

#### *Female*

*Measurements.* *Holotype*: body 12.3 mm, forewing 10.2 mm, malar space L : W 0.31. *Other material* (n = 30)—*Measurements and ranges*: body 12.0 mm (10.0–13.3 mm), foreleg 11.1 mm (10.0–12.8 mm), forewing 9.7 mm (8.5–10.2 mm), Ft+bt 3.7 mm (3.0–4.3 mm). *Ratios*: FL : B 0.92 (0.82–1.04), malar space L : W 0.29 (0.24–0.35).

*Integumental colour.* Head, antennae, mesosoma including legs, metasoma black.

*Structure.* Head: mouth-parts (Fig. 59A–G); glossa one-quarter length of prementum, labial palp extending to tip of glossa, ligular arms occupying basal half of prementum (Fig. 59A); cardo slightly shorter than stipes, galea and stipes of equal length, galea acutely pointed (Fig. 59D), comb of 18 teeth (Fig. 59E); labrum two and a half times wider than long (56 : 21), anterior margin evenly convex (Fig. 59G). Mesosoma: forelegs slightly attenuated, equal length of body, hind tibia (Fig. 60B) at widest point as wide as basitarsus, basitarsus nearly two and a half times longer than wide (28 : 68), rounded distally, projecting only slightly beyond insertion of tarsomere 2, without scale on distal dorsal angle. Metasoma: propodeal triangle small, clearly defined.

*Sculpture.* Head: large dense punctures on disc of clypeus, area between punctures shiny. Mesosoma: distance between punctures on disc of scutum greater than their diameter, surface between punctures shiny; surface of propodeal triangle wrinkled, rest of propodeum with fine scattered punctures.

*Vestiture.* Head: short light brown branched hairs on clypeus, longer and more dense on paraocular and supraclypeal areas. Mesosoma: long light brown pile on episternal areas and three basal segments of legs; short pale brown vestiture on scutum, scutellum, metanotum and propodeum, isolated black hairs on margins of scutum; disc of scutum usually devoid of pubescence. Oil-collecting hairs on tarsomeres 2–5 of forelegs only (Fig. 60C). Metasoma: T1 with long pale straw-coloured sub-erect hairs on apical third, denser laterally, short appressed similar coloured hairs on T2, longer, denser and more erect laterally, T3 and T4 with short decumbent black hair, longer and light brown laterally. Fimbriae of T5 and T6 dark brown with some black hairs laterally on T5.

#### *Male*

*Measurements.* *Allotype*: body 11.0 mm, forewing 9.2 mm, malar space L : W 0.25. *Other material* (n = 8)—*Measurements and ranges*: body 10.6 mm (10.0–11.2 mm), foreleg 8.1 (8.1–8.6 mm), forewing 8.6 mm (8.3–9.0 mm). *Ratios*: FL : B 0.76 (0.70–0.80), malar space L : W 0.28 (0.25–0.32).

*Integumental colour.* Head, antennae, mesosoma, legs, metasoma black, tegulae light brown to piceous.

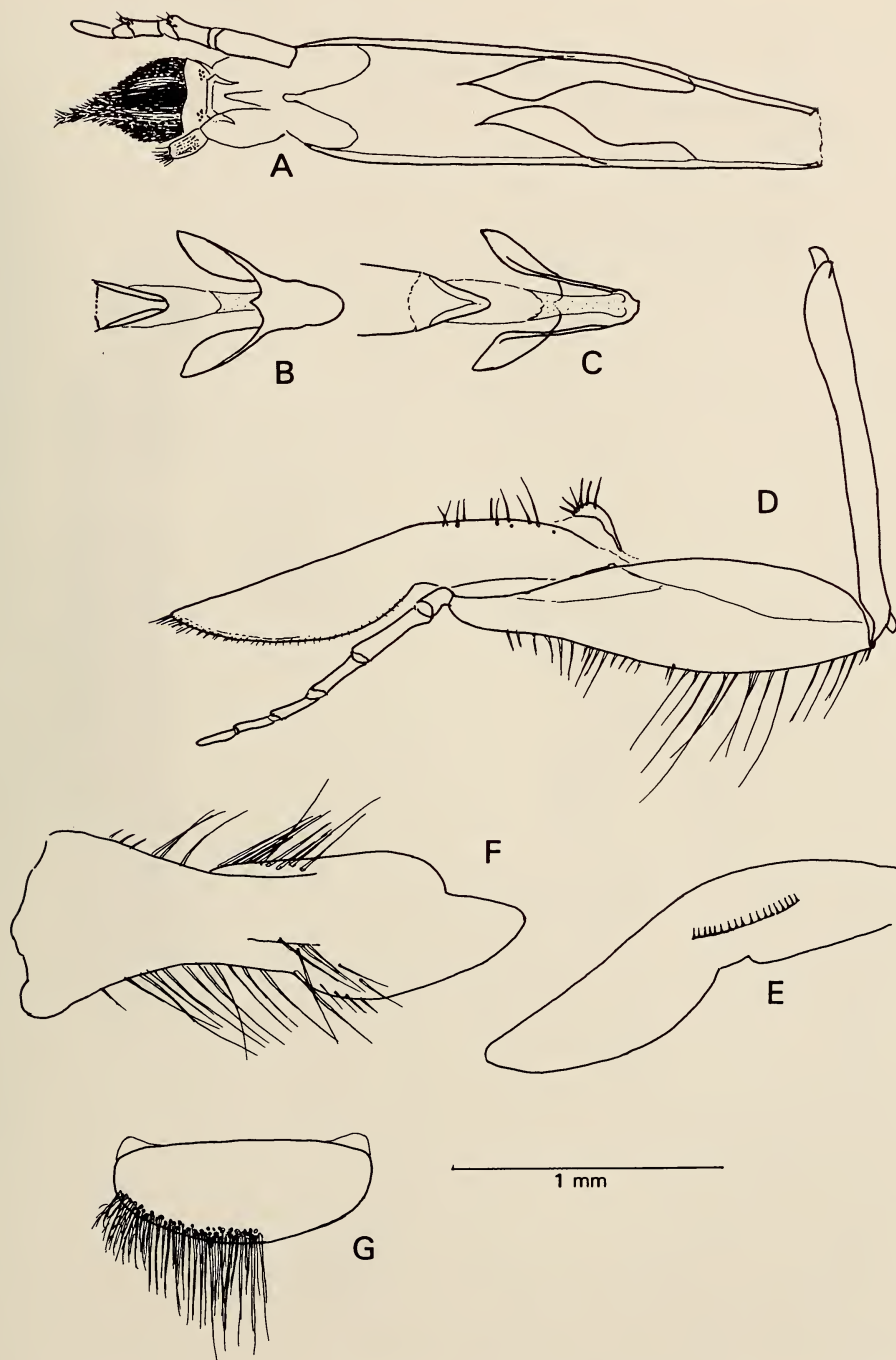


Fig. 59. *Rediviva nitida* sp. nov. Female. A. Labium, anterior aspect. B. Base of prementum with mentum and lorum, anterior view. C. Base of prementum with mentum and lorum, posterior view. D. Left maxilla. E. Inner view of galea to show comb. F. Right mandible. G. Labrum.

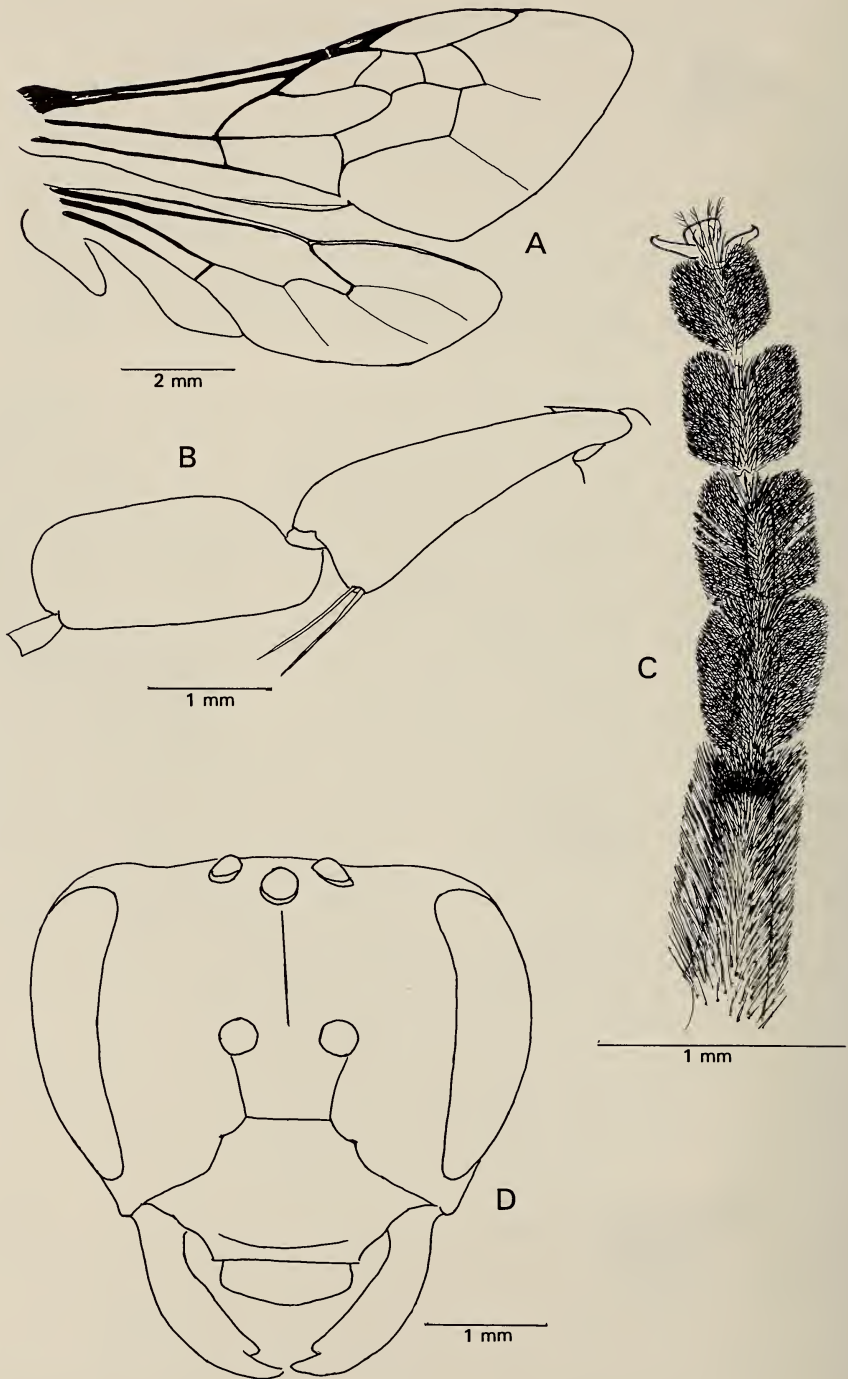


Fig. 60. *Rediviva nitida* sp. nov. Female. A. Right wings. B. Tibia and basitarsus of hind leg. C. Basitarsus and tarsomeres 2-5 of front leg. D. Anterior view of head.



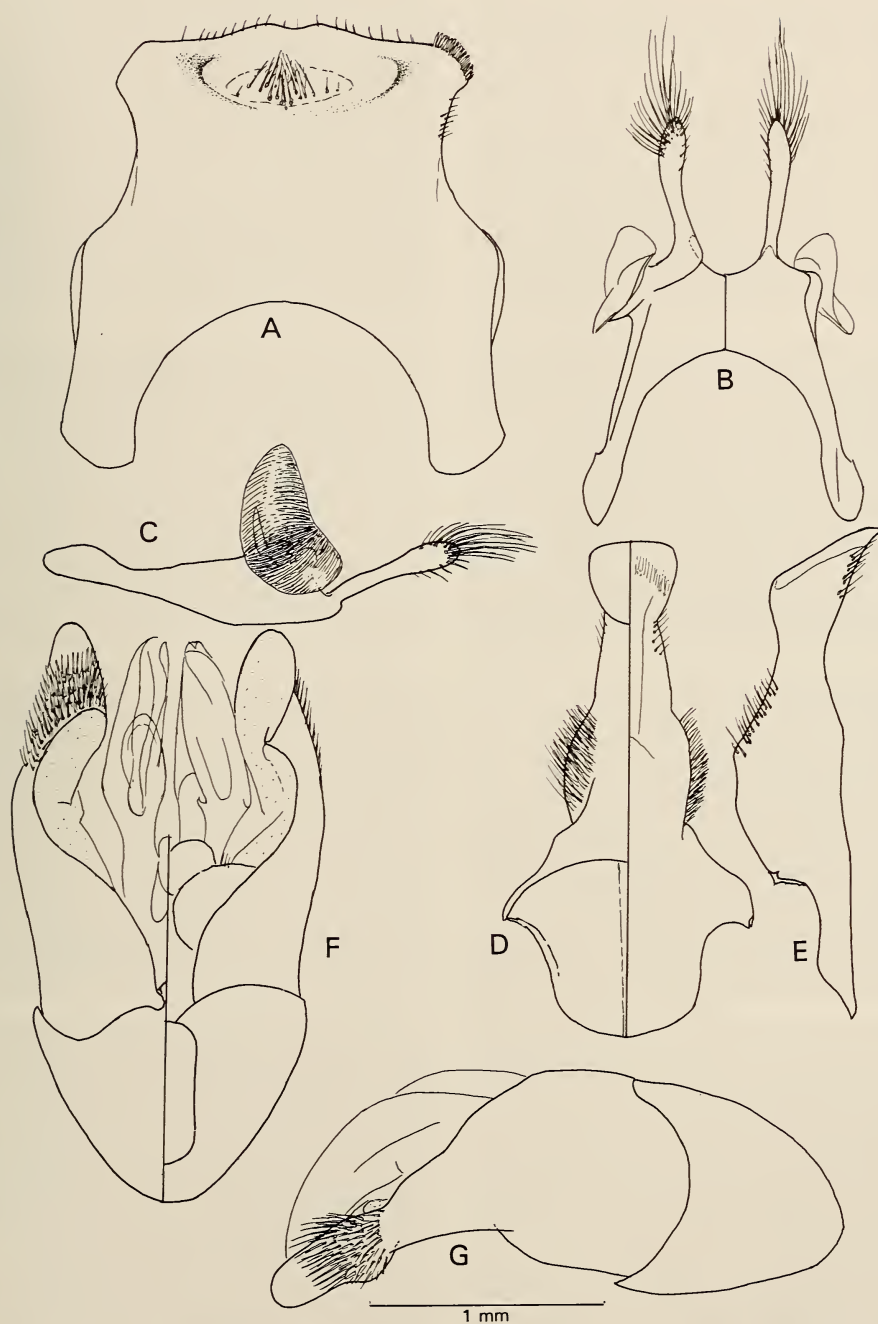


Fig. 61. *Rediviva nitida* sp. nov. Male. A. S6, ventral view. B. Dorsal and ventral view of S7. C. Lateral view of S7. D. Dorsal and ventral view of S8. E. Lateral view of S8. F. Dorsal and ventral aspect of genitalia. G. Lateral view of genital capsule.

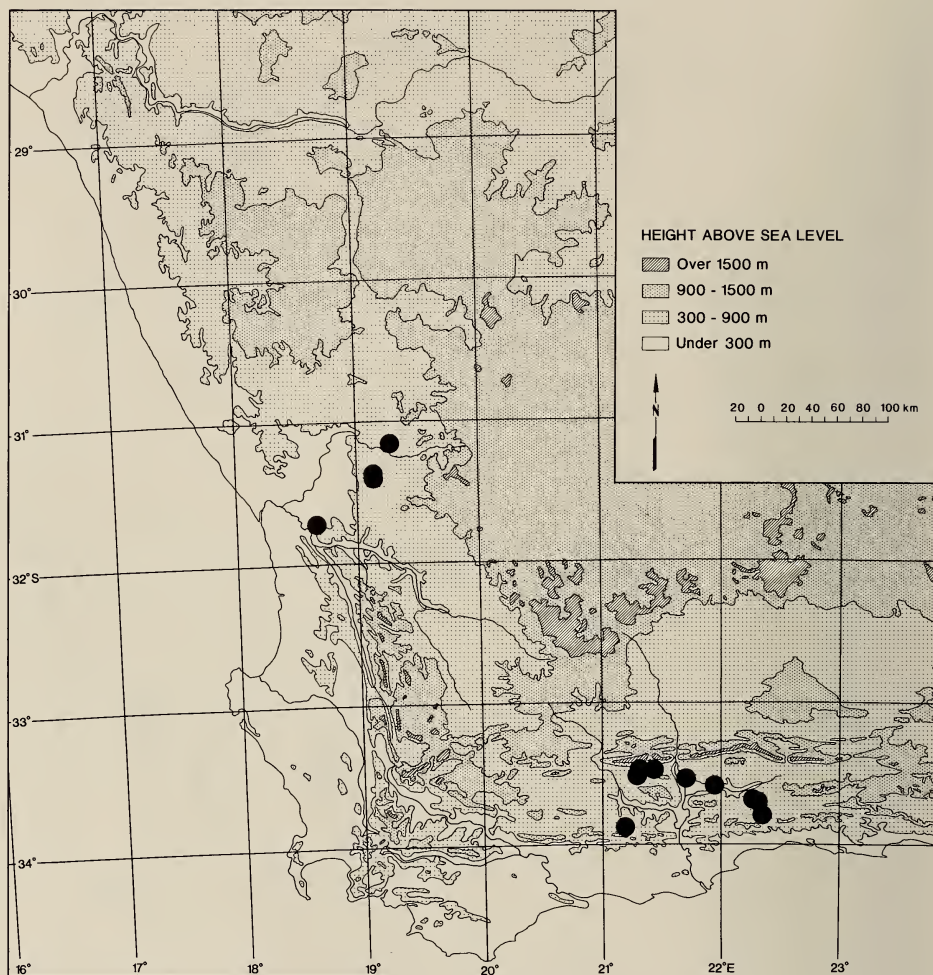


Fig. 62. Known distribution of *Rediviva nitida* sp. nov.

**Structure.** Mesosoma: tibia of hind leg nearly twice as wide as basitarsus (9 : 5). Metasoma: S6 (Fig. 61A) anterior third of segment concave, shiny, with cluster of black erect hairs on middle of proximal edge of concavity, median and lateral lobes poorly developed, apical margin of lateral lobes with short stout bristles; S7 (Fig. 61B-C) median lobes long, spatulate, apical hairs as long as lobe, lateral lobes large, crescent-shaped, translucent, strigate; S8 (Figs 61D-E, 63G) apical plate ovate, concave, narrow, more than twice as long as wide. Genitalia (Fig. 61F-G), gonoforceps as long as penis valves, stout unbranched hairs on apical third not reaching distal margin.

**Sculpture.** Large dense punctures on disc of clypeus, punctures sometimes coalescing, surface between punctures smooth shiny. Punctuation on disc of scutum of two sizes, finer and less dense than on clypeus, surface between punctures smooth, shiny.



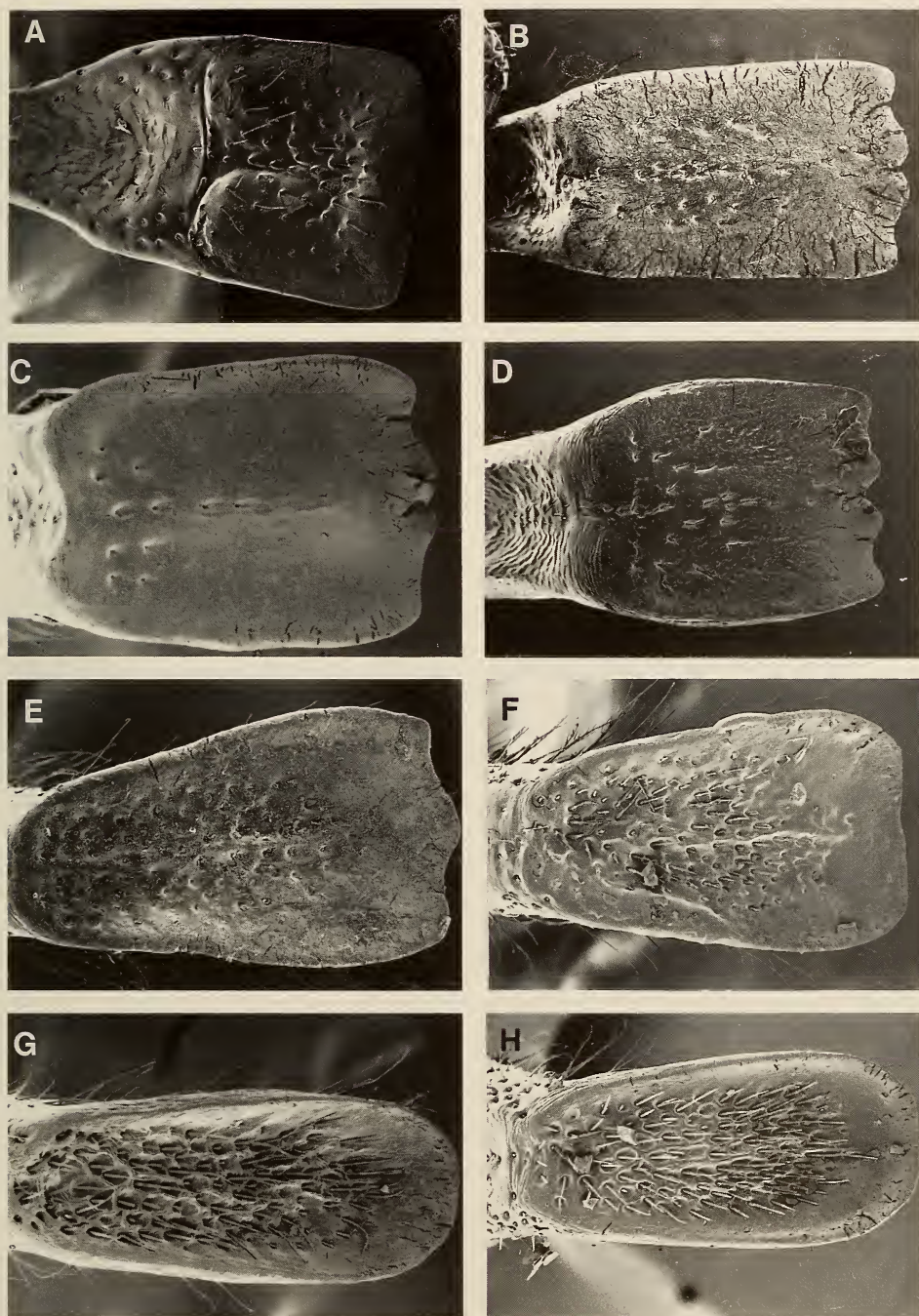


Fig. 63. Expanded distal portion of S8 (apical plate) of *Rediviva* males. A. *R. albifasciata*. B. *R. emdeorum*. C. *R. aurata*. D. *R. ruficornis*. E. *R. parva*. F. *R. alonsoae*. G. *R. nitida*. H. *R. micheneri*.



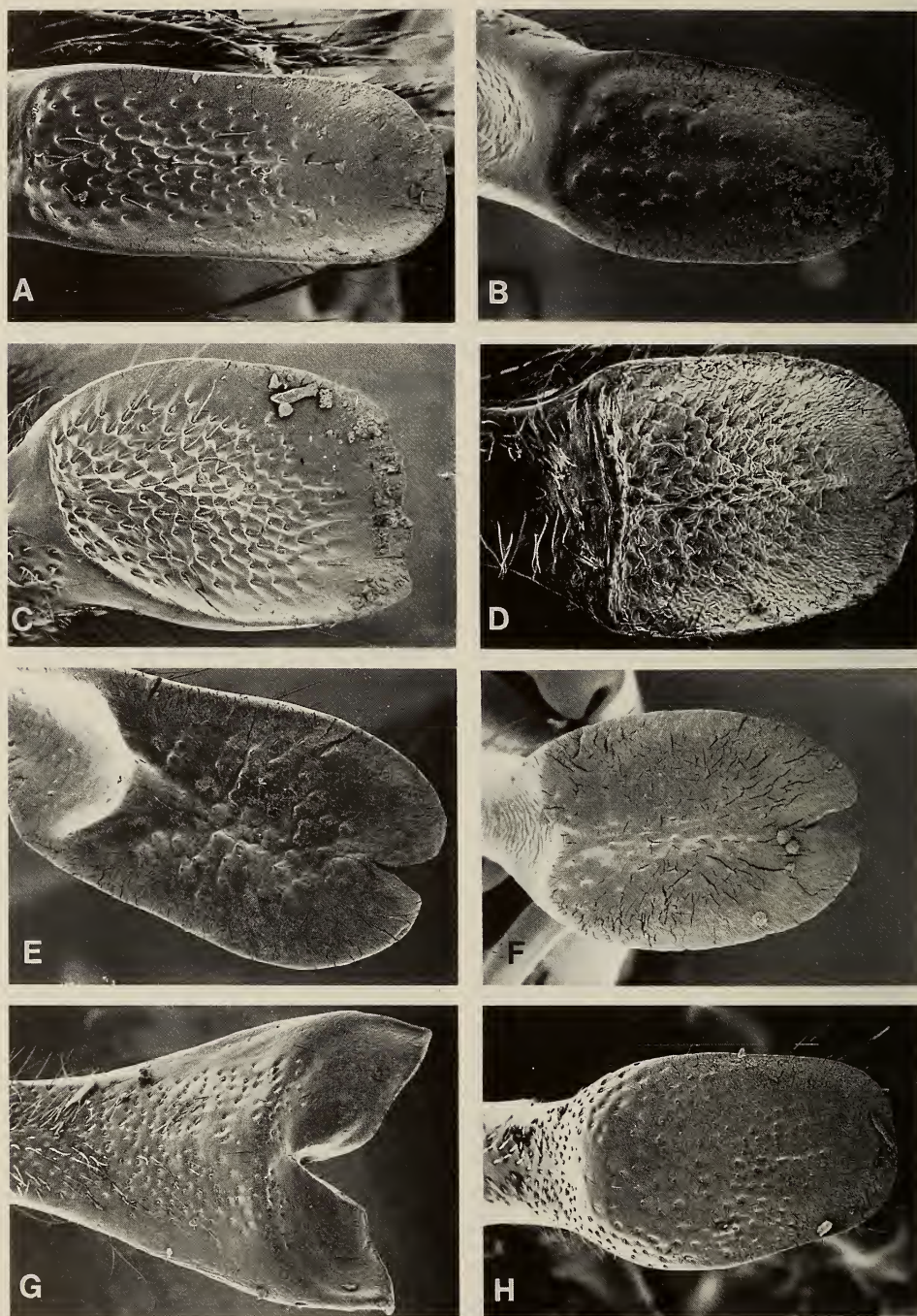


Fig. 64. Expanded distal portion of S8 (apical plate) of *Rediviva* and *Redivivoides* males.  
 A. *Rediviva longimanus*. B. *R. peringueyi*. C. *R. macgregori*. D. *R. intermedia*.  
 E. *R. bicava*. F. *R. intermixta*. G. *R. gigas*. H. *Redivivoides simulans*.

*Vestiture.* Head: long silky white decumbent plumose hairs on clypeus and paraocular areas, erect black hairs on inner ocular margin. Mesosoma: pale straw-coloured erect hairs on scutum, scutellum, metanotum and propodeum, some black hairs on margins of scutellum. Similar coloured pubescence on episterna and three basal segments of legs, patch of black hairs on distal dorsal half of tibia and basitarsus of hind leg. Metasoma: T1 erect pale straw-coloured hairs on most of segment, some black hairs on basal area, T2 and T3 progressive increase of black hairs basally, T4 anterior third with light coloured hairs, basal two-thirds black, T5 and T6 with black hairs only, T7 black to dark brown.

#### *Host flower records*

Eight *Diascia*, two *Hemimeris* and one *Alonsoa* species, were visited for oil by *R. nitida* females. The majority were collected in the Nieuwoudtville area on *Diascia cardiosepala* (44.7%), and in the Little Karoo on *D. bicolor* and *D. decipiens* (35.9%). Of the remainder, half were taken on *D. 'floribunda'* and *D. ellaphieae* and the rest on *Alonsoa unilabiata*, *D. lewisiae*, *D. sacculata*, *D. fragrans* and *Hemimeris racemosa*.

The relatively few females (14) that were seen to visit nectar plants were mainly on *Moraea bifida* and *Arctotheca calendula*. The remainder visited *Ixia* and other *Moraea* species, *Oxalis obtusa*, *Selago fourcadei* and *Sisymbrium orientale*.

Nectar plants visited by males were *Arctotheca calendula* (4), *Lotononis hirsuta* (2) and *Moraea miniata* (1). Two males were also caught patrolling *Diascia decipiens*.

#### *Distribution* (Fig. 62)

*Rediviva nitida* occurs as two disjunct populations. Most of our material originates from the Nieuwoudtville Wild Flower Reserve and adjoining farms on the Bokkeveldberge escarpment. Off the escarpment isolated specimens have been collected at a site north of the Klawer turn off on the N7. The other population is widely distributed in the Little Karoo from Ladismith through to Calitzdorp, Oudtshoorn and south on the N12 to sites near Blossoms and Zebra.

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oil-bee collection but assisted with field work and was also responsible for the SEM photography of male bee terminalia.

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In addition, many municipalities have small local reserves in which they allowed us to do research. The board of the Nieuwoudtville Wild Flower Reserve, under the chairmanship of Neil Macgregor, has been most accommodating and over a period of several years we have been able to accumulate valuable information, not only on oil-collecting bees and their flower relationships but on other pollinators and their host plants as well. Other municipalities that have been of assistance to us in the survey of oil-collecting bees are Malmesbury, Franschhoek, Stellenbosch and Ladismith.

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## REFERENCES

- CANE, J. H., EICKWORT, F., WESLEY, F. R. & SPIELHOLTZ, J. 1983. Foraging, grooming and mating behavior of *Macropis nuda* (Hymenoptera: Melittidae) and use of *Lysimachia ciliata* (Primulaceae) oils in larval provisions and cell linings. *The American Midland Naturalist* **110** (2): 257-264.
- COCKERELL, C. D. 1931. Some African bees. *Annals and Magazine of Natural History* (10) **8**: 400-410.
- COCKERELL, C. D. 1934. Descriptions and records of bees. CLVIII. *Annals and Magazine of Natural History* (10) **13**: 444-456.
- EDWARDS, D. & LEISTNER, O. A. 1971. A degree reference system for citing biological records in southern Africa. *Mitteilungen aus der Botanischen Staatssammlung. Munchen.* **10**: 501-509.
- FRIESE, H. 1911. Neue Bienen der Äthiopischen Region. *Zoologischen Jahrbüchern. Abteilung für Systematik, Geographie und Biologie der Tiere* **30** (6): 671-678.



- HARRIS, R. A. 1979. A glossary of surface sculpturing. *Occasional Papers in Entomology. California Department of Food and Agriculture* **28**: 1-25.
- HILLIARD, O. M. & BURT, B. L. 1984. Revision of *Diascia* section *Racemosae*. *Journal of South African Botany* **50** (30): 269-234.
- MANNING, J. C. & BROTHERS, D. J. 1986. Floral relations of four species of *Rediviva* in Natal (Hymenoptera: Apoidea: Melittidae). *Journal of the Entomological Society of southern Africa* **40** (1): 107-114.
- MICHENER, C. D. 1944. Comparative external morphology, phylogeny, and a classification of the bees (Hymenoptera). *Bulletin of the American Museum of Natural History* **82** (6): 158-326.
- MICHENER, C. D. 1981. Classification of the bee family Melittidae with a review of species of Meganomiinae. *Contributions of the American Entomological Institute* **18** (3): 1-135.
- MICHENER, C. D. & GREENBERG, L. 1980. Ctenoplectridae and the origin of the long-tongued bees. *Zoological Journal of the Linnaean Society* **69**: 185-203.
- ROBERTS, R. B. & BROOKS, R. W. 1987. Agapostemonine bees of Mesoamerica (Hymenoptera: Halictidae). *University of Kansas Science Bulletin* **53** (7): 357-392.
- ROIG-ALSINA, A. & MICHENER, C. D. 1993. Studies of phylogeny and classification of long-tongued bees (Hymenoptera: Apoidea). *The University of Kansas Science Bulletin* **55**: 123-173.
- SIMPSON, B. B. & NEFF, J. L. 1981. Floral rewards: alternative to pollen and nectar. *Annals of the Missouri Botanical Gardens* **68**: 301-322.
- SIMPSON, B. B. & NEFF, J. L. 1983. Evolution and diversity of floral rewards. In: JONES, C. E. & LITTLE, R. J. eds. *Handbook of experimental pollen biology*: 142-159. New York: Van Nostrand Reinhold.
- SIMPSON, B. B., NEFF, J. L. & SIEGLER, D. 1983. Floral Biology and floral rewards of *Lysimachia* (Primulaceae). *American Midland Naturalist* **110**: 249-256.
- STEINER, K. E. 1987. Oil-producing orchids and oil-collecting bees in southern Africa. *Annual Congress of the South African Association of Botanists, Durban*. Abstracts: 81.
- STEINER, K. E. 1989. The pollination of *Disperis* (Orchidaceae) by oil-collecting bees in southern Africa. *Lindleyana* **4** (4): 164-183.
- STEINER, K. E. 1990. The *Diascia* (Scrophulariaceae) window: an orientation cue for oil-collecting bees. *Botanical Journal of the Linnean Society* **102**: 175-195.
- STEINER, K. E. 1993a. Oil-orchids and oil-bees in southern Africa-*Disperis* and *Rediviva*. *South African Orchid Journal* **24** (1): 3-5.
- STEINER, K. E. 1993b. Has *Ixianthes* (Scrophulariaceae) lost its special bee? *Plant Systematics and Evolution* **185**: 7-16.
- STEINER, K. E. & WHITEHEAD, V. B. 1988. The association between oil-producing flowers and oil-collecting bees in the Drakensberg of South Africa. *Monographs in Systematic Botany from the Missouri Botanical Gardens* **25**: 259-277.
- STEINER, K. E. & WHITEHEAD, V. B. 1990. Pollinator adaption to oil-secreting flowers—*Rediviva* and *Diascia*. *Evolution* **44** (6): 1701-1707.
- STEINER, K. E. & WHITEHEAD, V. B. 1991. Oil flowers and oil bees: Further evidence for pollinator adaption. *Evolution* **45** (6): 1443-1501.
- STEINER, K. E. & WHITEHEAD, V. B. 1996. The consequences of specialization for pollination in a rare South African shrub, *Ixianthes retzioides* (Scrophulariaceae). *Plant Systematics and Evolution* **201**: 131-138.
- VINSON, S. B., WILLIAMS, H. J., FRANKIE, G. W. & SHRUM, G. 1997. Floral lipid chemistry of *Byrsonima crassifolia* (Malpighiaceae) and a use of floral lipids by *Centris* bees (Hymenoptera: Apidae). *Biotropica* **29**: 76-83.
- VOGEL, S. 1969. Flowers offering fatty oil instead of nectar. *International Botanical Congress Abstracts* **11**: 229.
- VOGEL, S. 1971. Ölproduzierende blumen, die durch ölsammelnde bienen bestäubt werden. *Naturwissenschaften* **58**: 58.
- VOGEL, S. 1974. Ölblumen und ölsammelnde bienen. *Tropische und Subtropische Pflanzenwelt* **7**: 285-547.
- VOGEL, S. 1976. *Lysimachia*: Öblumen der Holartis. *Naturwissenschaften* **63**: 44-45.
- VOGEL, S. 1981. Abdominal oil-mopping—a new type of foraging in bees. *Naturwissenschaften* **67**: 627-628.

- VOGEL, S. 1984. The *Diascia* flower and its bee- and oil-based symbiosis in southern Africa. *Acta Botanica Neerlandica* **33** (4): 509-518.
- VOGEL, S. 1986. Ölblumen und ölsammelnde bienen. Zweiten Folge. *Lysimachia* und *Macropis*. *Tropische und Subtropische Pflanzenwelt* **54**: 149-312.
- VOGEL, S. 1990. Ölblumen und ölsammelnde bienen. Dritte Folge. *Mormodica*, *Thalidiantha* und die Cteniplectridae. *Tropische und Subtropische Pflanzenwelt* **73**: 5-186.
- VOGEL, S. & MICHENER, C. D. 1985. Long bee legs and oil-producing floral spurs, and a new *Rediviva* (Hymenoptera, Melittidae; Scrophulariaceae). *Journal of the Kansas Entomological Society* **58** (2): 359-364.
- WHITEHEAD, V. B., SCHELPE, A. E. C. L. E. & ANTHONY, E. 1984. The bee *Rediviva longimanus* Michener (Apoidea, Melittidae) collecting pollen and oil from *Diascia longicornis* (Thunb.) Druce (Scrophulariaceae). *South African Journal of Science* **80**: 286.
- WHITEHEAD, V. B. & STEINER, K. E. 1993. A new *Rediviva* bee (Hymenoptera: Apoidea: Melittidae) that collects oil from orchids. *African Entomology* **1** (2): 159-166.
- WHITEHEAD, V. B. & STEINER, K. E. 1994. A new *Rediviva* bee from the North-Western Cape Province, South Africa. *Annals of the South African Museum* **104** (1): 1-11.
- WINSTON, M. L. 1979. The proboscis of the long-tongued bees: a comparative study. *University of Kansas Science Bulletin* **51** (22): 631-667.

## APPENDIX 1

Oil, nectar and pollen plants of *Rediviva* of the winter rainfall area.

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. albifasciata</i>	Females	<b>Scrophulariaceae</b> <i>Colpias mollis</i> E. Meyer ex Benth. <i>Hemimeris racemosa</i> (Houtt.) Merrill	<b>Fumariaceae</b> <i>Cysticapnos versicaria</i> (L.) Fedde <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L.
	Males		<b>Asteraceae</b> <i>Othonna arbuscula</i> (Thunb.) Sch. Bip. <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L. <i>O. comosa</i> E. Meyer ex Sonder
<i>R. alonsoae</i>	Females	<b>Scrophulariaceae</b> <i>Alonsoa unilabiata</i> (L.f.) Steudel	<b>Fabaceae</b> <i>Lotononis hirsuta</i> (Thunb.) D. Dietr. <b>Iridaceae</b> <i>Moraea miniata</i> Andrews <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L. <i>Oxalis obtusa</i> Jacq.
	Males		<b>Fabaceae</b> <i>Lotononis hirsuta</i> (Thunb.) D. Dietr. <b>Oxalidaceae</b> <i>Oxalis obtusa</i> Jacq.



## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. aurata</i>	Females	<b>Scrophulariaceae</b> <i>Diascia 'arenicola bulbosa'</i> <i>D. capensis</i> (L.) Britten <i>D. 'collina'</i> <i>D. diffusa</i> Benth. <i>D. elongata</i> Benth. <i>D. 'granitiana'</i> <i>D. 'speciosa'</i>	<b>Iridaceae</b> <i>Moraea miniata</i> Andrews <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L.
	Males		<b>Iridaceae</b> <i>Moraea miniata</i> Andrews <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L.
<i>R. bicava</i>	Females	<b>Scrophulariaceae</b> <i>D. parviflora</i> Benth. <i>D. patens</i> (Thunb.) Fourcade <i>D. veronicoides</i> Schl. <i>Hemimeris gracilis</i> Schl. <i>H. racemosa</i> (Houtt.) Merill	<b>Fumariaceae</b> <i>Cysticapnos vesicaria</i> (L.) Fedde <b>Lamiaceae</b> <i>Stachys aethiopica</i> L. <b>Oxalidaceae</b> <i>Oxalis obtusa</i> Jacq. <i>O. pes-caprae</i> L. <b>Scrophulariaceae</b> <i>Nemesia leipoldtii</i> Heirn <b>Indet.</b> <i>Bulbine</i> sp., <i>Lachenalia</i> sp., <i>Polygala</i> sp.

## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<b>R. bicava (contd)</b>	Males		<b>Fabaceae</b> <i>Lotononis hirsuta</i> (Thunb.) D. Dietr. <b>Fumariaceae</b> <i>Cysticapnos vesicaria</i> (L.) Fedde <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L. <b>Indet.</b> <i>Senecio</i> sp.
<b>R. emdeorum</b>	Females	<b>Scrophulariaceae</b> <i>Diascia 'floribunda'</i> <i>D. insignis</i> K. E. Steiner <i>D. macrophylla</i> (Thunb.) Spreng. <i>D. namaquensis</i> Hiern. <i>D. tanyceras</i> E. Meyer ex Benth <i>D. 'tenuis'</i> <i>D. 'whiteheadii'</i>	<b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns <b>Indet.</b> <i>Moraea</i> sp., <i>Lachenalia</i> sp., <i>Oxalis</i> sp., <i>Trachyanthra</i> sp.
	Males		<b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns <b>Indet.</b> <i>Moraea</i> sp.
<b>R. gigas</b>	Females	<b>Orchidaceae</b> <i>Ceratandra atrata</i> (L.) T. Durand & Schinz <i>C. bicolor</i> Sond. ex H. Bol. <i>Pterygodium acutifolium</i> Lindl. <i>Satyrium rhynchanthum</i> Bol.	<b>Haemodorumaceae</b> <i>Wachendorfia paniculata</i> L. <b>Iridaceae</b> <i>Moraea ramosissima</i> (L.f.) Druce <i>Watsonia borbonica</i> (Pouret) Goldblatt

## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. gigas</i> (contd)	Females	<b>Scrophulariaceae</b> <i>Ixianthes retzioides</i> Benth.	<i>W. marginata</i> (L.f.) Ker Gawler
	Males		<b>Haemodoraceae</b> <i>Wachendorfia paniculata</i> L. <b>Iridaceae</b> <i>Moraea ramosissima</i> (L.f.) Druce <i>Watsonia marginata</i> (L.f.) Ker Gawler
<i>R. intermedia</i>	Females	<b>Scrophulariaceae</b> <i>Alonsoa unilabiata</i> (L.f.) Steudel <i>Diascia cardiosepala</i> Hiern <i>Diascia 'floribunda'</i> <i>D. macrophylla</i> (Thunb.) Spreng. <i>D. nana</i> Diels <i>Hemimeris centrodes</i> Hiern <i>H. racemosa</i> (Houtt.) Merrill	<b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns
	Males		<b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns <b>Indet.</b> <i>Othonna</i> sp., <i>Heliophila</i> sp.
<i>R. intermixta</i>	Females	<b>Scrophulariaceae</b> <i>Alonsoa unilabiata</i> (L.f.) Steudel <i>Diascia 'arenicola'</i> <i>D. 'bicornuta'</i>	<b>Asodelaceae</b> <i>Bulbinella floribunda</i> (Alton) Durand & Schinz <b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns



## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. intermixta</i> (contd)	Females	<p><i>D. cardiosepala</i> Hiern</p> <p><i>D. floribunda</i>'</p> <p><i>D. lewisiae</i> K. E. Steiner</p> <p><i>D. longicornis</i> (Thunb.) Druce</p> <p><i>D. macrophylla</i> (Thunb.) Spreng.</p> <p><i>D. parviflora</i> Benth.</p> <p><i>D. tanyceras</i> E. Meyer ex Benth.</p> <p><i>D. veronicoides</i> Schltr.</p> <p><i>D. 'whiteheadii'</i></p> <p><i>Hemimeris centrodus</i> Hiern</p> <p><i>H. racemosa</i> (Houtt.) Merrill</p>	<p><i>Senecio arenarius</i> Thunb.</p> <p><i>S. littoreus</i> Thunb.</p> <p><b>Brassicaceae</b></p> <p><i>Raphanus raphanistrum</i> L.</p> <p><b>Iridaceae</b></p> <p><i>Geissorhiza aspera</i> Goldblatt</p> <p><i>Moraea bifida</i> (L. Bolus) Goldblatt</p> <p><i>M. miniata</i> Andrews</p> <p><b>Geraniaceae</b></p> <p><i>Erodium cicutarium</i> (L.) L'Heritier</p> <p><b>Neuradaceae</b></p> <p><i>Griehum humifusum</i> Thunb.</p> <p><b>Oxalidaceae</b></p> <p><i>Oxalis obtusa</i> Jacq.</p> <p><i>O. pes-caprae</i> L.</p> <p><b>Indet.</b> <i>Polycarena</i> sp., <i>Polygala</i> sp., <i>Romulea</i> sp., <i>Wachendorfia</i> sp., <i>Zygophyllum</i> sp.</p>
	Males		<p><b>Asteraceae</b></p> <p><i>Arcotheca calendula</i> (L.) Levyns</p> <p><i>Senecio arenarius</i> Thunb.</p> <p><i>S. littoreus</i> Thunb.</p> <p><b>Iridaceae</b></p> <p><i>Moraea bifida</i> (L. Bolus) Goldblatt</p> <p><i>M. miniata</i> Andrews</p>

## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. internixta</i> (contd)	Males		<b>Fabaceae</b> <i>Lotononis hirsuta</i> (Thunb.) D. Dietr. <b>Fumariaceae</b> <i>Cysticapnos vesicaria</i> (L.) Fedde <b>Oxalidaceae</b> <i>Oxalis obtusa</i> Jacq. <i>O. pes-caprae</i> L. <b>Indet.</b> <i>Othonna</i> sp.
<i>R. longimanus</i>	Females	<b>Orchidaceae</b> <i>Disperis circumflexa</i> (L.) T. Durand & Schinz <i>Pterygodium pentherianum</i> Schltr. <i>P. schelpei</i> H. Linder <b>Scrophulariaceae</b> <i>Diascia 'bicornuta'</i> <i>D. 'floribunda'</i> <i>D. parviflora</i> Benth <i>D. 'whiteheadii'</i>	<b>Iridaceae</b> <i>Moraea bifida</i> (L. Bolus) Goldblatt <i>M. fragrans</i> Goldblatt <i>Moraea tripetala</i> (L.f.) Ker Gawler
	Males		<b>Fumariaceae</b> <i>Cysticapnos vesicaria</i> (L.) Fedde <b>Iridaceae</b> <i>Moraea bifida</i> (L. Bolus) Goldblatt <i>M. miniata</i> Andrews <i>Moraea tripetala</i> (L.f.) Ker Gawler <b>Orchidaceae</b> <i>Holothrix aspera</i> (Lindl.) Reichb. f.

## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<b>R. macgregori</b>	Females	<b>Orchidaceae</b> <i>Corycium deflexum</i> (Bolus) Rolfe <i>Disperis purpurata</i> Reichb.. <i>Pterygodium hallii</i> (Schelpe) Kurzweil & Linder <b>Scrophulariaceae</b> <i>Alonsoa unilabiata</i> (L.f.) Steudel <i>Diascia cardiosepala</i> Hiern <i>D. dissimulans</i> Hilliard & Burt <i>D. 'floribunda'</i> <i>D. insignis</i> K. E. Steiner <i>D. lewisiae</i> K. E. Steiner <i>D. macrophylla</i> (Thunb.) Spreng. <i>D. tanyceras</i> E. Meyer ex Benth. <i>D. parviflora</i> Benth. <i>D. veronicoides</i> Schltr. <i>D. 'whiteheadii'</i> <i>Hemimeris centrodes</i> Hiern <i>H. racemosa</i> (Houtt.) Merrill <i>H. sabulosa</i> L. f.	<b>Aspodelaceae</b> <i>Bulbinella nutans</i> (Thunb.) Dur. & Schinz <b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns <b>Iridaceae</b> <i>Geissorhiza splendidissima</i> Diels <i>Hesperantha cucullata</i> Klatt <i>Moraea bifida</i> (L. Bolus) Goldblatt <i>Moraea pritzeliana</i> Diels <i>Moraea tripetala</i> (L.f.) Ker Gawler <i>Sparaxis elegans</i> (Sweet) Goldblatt <b>Scrophulariaceae</b> <i>Nemesia leipoldtii</i> Hiern
	Males		<b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns <i>Dimorphotheca pluvialis</i> (L.) Moench <i>Senecio littoreus</i> Thunb.



## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. macgregori</i> (contd)	Males		<b>Fabaceae</b> <i>Lotononis hirsuta</i> (Thunb.) D. Dietr. <b>Iridaceae</b> <i>Homeria bifida</i> (L. Bolus) Goldblatt <i>Moraea prezeliana</i> Diels <i>Moraea tripetala</i> (L.f.) Ker Gawler <b>Indet.</b> <i>Felicia</i> sp., <i>Othoma</i> sp.
<i>R. micheneri</i>	Females	<b>Scrophulariaceae</b> <i>Diascia 'arenicola arenicola'</i> <i>D. 'arenicola bulbosa'</i> <i>D. capensis</i> (L.) Britten <i>D. elongata</i> Benth. <i>D. 'grantiana'</i> <i>D. longicornis</i> (Thunb.) Druce <i>D. 'spectiosa'</i> <i>D. 'whiteheadii'</i>	<b>Iridaceae</b> <i>Moraea fugax</i> (Delaroche) Jacq. <i>Moraea miniata</i> Andrews <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L. <b>Indet.</b> <i>Dimorphotheca</i> sp.
	Males		<b>Iridaceae</b> <i>Moraea miniata</i> Andrews
<i>R. nitida</i>	Females	<b>Scrophulariaceae</b> <i>Alonsoa unilabiata</i> (L.f.) Steudel <i>Diascia bicolor</i> K. E. Steiner <i>D. cardiosepala</i> Hiern <i>D. decipiens</i> K. E. Steiner <i>D. ellaphieae</i> K. E. Steiner <i>D. 'floribunda'</i>	<b>Asteraceae</b> <i>Arctotheca calendula</i> (L.) Levyns <b>Brassicaceae</b> <i>Sisymbrium orientale</i> L. <b>Iridaceae</b> <i>Moraea bifida</i> (L. Bolus) Goldblatt <i>M. miniata</i> Andrews

## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. nitida</i> (contd)	Females	<i>D. fragrans</i> K. E. Steiner <i>D. lewisiae</i> K. E. Steiner <i>D. sacculata</i> Benth. <i>Hemimeris gracilis</i> Schltr. <i>H. racemosa</i> (Houtt.) Merrill	<b>Oxalidaceae</b> <i>Oxalis obtusa</i> Jacq. <b>Scrophulariaceae</b> <i>Selago fourcadei</i> Hilliard
	Males		<b>Iridaceae</b> <i>Moraea miniata</i> Andrews
<i>R. parva</i>	Females	<b>Orchidaceae</b> <i>Corycium crispum</i> (Thunb.) Sw. <b>Scrophulariaceae</b> <i>Alonsoa unilabiata</i> (L.f.) Steudel <i>Diascia 'arenicola arenicola'</i> <i>Diascia 'arenicola bulbosa'</i> <i>D. batteniana</i> K. E. Steiner <i>D. capensis</i> (L.) Britten <i>D. ellaphiae</i> K. E. Steiner <i>D. elongata</i> Benth. <i>D. 'gratiana'</i> <i>D. lewisiae</i> K. E. Steiner <i>D. pachyceras</i> E. Mey. Ex Benth. <i>D. 'speciosa'</i> <i>Hemimeris racemosa</i> (Houtt.) Merrill <i>H. sabulosa</i> L.f.	<b>Fumariaceae</b> <i>Cysticapnos vesicaria</i> (L.) Fedde <b>Haenodoraceae</b> <i>Wachendorfia paniculata</i> L. <b>Iridaceae</b> <i>Geissorhiza aspera</i> Goldblatt <b>Oxalidaceae</b> <i>Oxalis obtusa</i> Jacq. <i>O. pes-caprae</i> L. <b>Polygalaceae</b> <i>Nylandtia spinosa</i> (L.) Dumort. <b>Indet.</b> <i>Heliophila</i> sp., <i>Trachyandra</i> sp.

## APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. parva</i> (contd)	Males		<b>Fumariaceae</b> <i>Cysticapnos vesicaria</i> (L.) Fedde <b>Haemodoraceae</b> <i>Wachendorfia paniculata</i> L. <b>Iridaceae</b> <i>Moraea miniata</i> Andrews <b>Oxalidaceae</b> <i>Oxalis obtusa</i> Jacq. <i>O. pes-caprae</i> L. <i>Indet. Moraea</i> sp., <i>Oxalis</i> sp.
<i>R. peringueyi</i>	Females	<b>Orchidaceae</b> <i>Corycium orobanchoides</i> (L.f.) Sw. <i>Disperis circumflexa</i> (L.) T. Durand & Schinz <i>D. cucullata</i> Sw. <i>D. villosa</i> (L. f.) Sw. <i>Pterygodium alatum</i> (Thunb.) Sw. <i>P. caffrum</i> (L.) Sw. <i>P. catholicum</i> (L.) Sw. <i>P. hallii</i> (Schelpe) Kurtzweil & Linder <i>P. inversum</i> (Thunb.) Sw. <i>P. volucris</i> (L.f.) Sw. <b>Scrophulariaceae</b> <i>Diascia 'arenicola'</i> <i>D. capensis</i> (L.) Britten <i>D. elongata</i> Benth. <i>D. 'granitana'</i>	<b>Brassicaceae</b> <i>Heliophila coronopifolia</i> L. <i>Raphanus raphanistrum</i> L. <b>Gentianaceae</b> <i>Chironia decumbens</i> Levyns <b>Iridaceae</b> <i>Moraea fugax</i> (Delaroché) Jacq. <i>M. gawleri</i> Spreng. <i>Moraea miniata</i> Andrews <b>Lamiaceae</b> <i>Stachys aethiopica</i> L. <i>Indet. Cyphia</i> sp., <i>Oxalis</i> sp., <i>Moraea</i> sp.



APPENDIX (contd)

SPECIES		OIL HOST PLANTS	NECTAR / POLLEN PLANTS
<i>R. peringueyi</i> (contd)	Females	<i>D. 'pusilla'</i> <i>Hemimeris racemosa</i> (Houtt.) Merrill <i>H. sabulosa</i> L.f.	
	Males		<b>Gentianaceae</b> <i>Chironia decumbens</i> Levyns <b>Iridaceae</b> <i>Moraea fugax</i> (Delaroché) Jacq. <i>M. gawleri</i> Spreng. <i>Moraea miniata</i> Andrews
<i>R. ruficornis</i>	Females	<b>Scrophulariaceae</b> <i>Alonsoa unilabiata</i> (L.f.) Steudel <i>Diascia 'arenicola arenicola'</i> <i>D. capensis</i> (L.) Britten <i>D. diffusa</i> Benth.	<b>Iridaceae</b> <i>Moraea miniata</i> Andrews
	Males		<b>Iridaceae</b> <i>Moraea miniata</i> Andrews <b>Oxalidaceae</b> <i>Oxalis pes-caprae</i> L.